

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

KEURIG, INCORPORATED,

Plaintiff,

v.

KRAFT FOODS GLOBAL, INC.,
TASSIMO CORPORATION, and
KRAFT FOODS INC.,

Defendants.

Civil Action No. 07-017 (GMS)

**JOINT APPENDIX OF INTRINSIC AND EXTRINSIC EVIDENCE
RELIED UPON IN CLAIM CONSTRUCTION BRIEFING**

Richard L. Horwitz (No. 2246)
David E. Moore (No. 3983)
POTTER ANDERSON & CORROON LLP
Hercules Plaza, 6th Floor
1313 N. Market Street
Wilmington, Delaware 19899
(302) 984-6000
rhorwitz@potteranderson.com
dmoore@potteranderson.com

David M. Schlitz
William S. Foster, Jr.
C. John Brown
BAKER BOTTS L.L.P.
1299 Pennsylvania Ave, N.W.
Washington, D.C. 20004-2400
(202) 639-7700

*Attorneys for Defendants
Kraft Foods Global, Inc., Tassimo Corp.,
and Kraft Foods, Inc.*

Dated: November 5, 2007

John W. Shaw (No. 3362)
Chad S.C. Stover (No. 4919)
YOUNG CONAWAY STARGATT
& TAYLOR, LLP
The Brandywine Building
100 West Street, 17th Floor
Wilmington, Delaware 19801
(302) 571-6600
jshaw@ycst.com
cstover@ycst.com

Michael A. Albert
Michael N. Rader
Laura E. Topper
Gerald B. Hryczyszyn
Wolf, Greenfield & Sacks, P.C.
600 Atlantic Ave.
Boston, MA 02210
(617) 646-8000

Attorneys for Plaintiff Keurig, Incorporated

PART

1 of 3

U.S.D.C. Del. Case No. 07-cv-0017-GMS
JOINT APPENDIX OF INTRINSIC AND EXTRINSIC EVIDENCE

<u>Tab</u>	<u>Description</u>	<u>Party Citing</u>	<u>Page(s)</u>
1	U.S. Patent 6,607,762	Keurig Kraft	A1-A9
2	From File History for U.S. Patent 6,607,762, Office Action dated September 24, 2002.	Keurig Kraft	A10-A14
3	From File History for U.S. Patent 6,607,762, Amendment, dated March 26, 2003.	Keurig Kraft	A15-A26
4	From File History for U.S. Patent 6,607,762, Notice of Allowability, dated June 3, 2003	Keurig Kraft	A27-A29
5	From File History for U.S. Patent 6,607,762, Provisional Application No. 60/183,569	Keurig Kraft	A30-A37
6	U.S. Patent 5,840,189	Keurig Kraft	A38-A43
7	U.S. Patent 5,325,765	Keurig Kraft	A44-A51
8	Accommodate: "to fit, adapt or make suitable", WEBSTER'S NEW UNIVERSAL UNABRIDGED DICTIONARY (2d ed. 1983)	Keurig	A52-A53
9	Accommodate: "to adapt to or fit in with", OXFORD DICTIONARY OF CURRENT ENGLISH (4th ed. 2006)	Keurig	A54-A56

<u>Tab</u>	<u>Description</u>	<u>Party Citing</u>	<u>Page(s)</u>
10	Chamber: "an enclosed or compartmented space for some special purpose." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 372 (2002).	Kraft	A57-A58
11	Pierce: "to run into or through as a pointed instrument or weapon does." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 1712 (2002).	Kraft	A59
12	-able: "capable of, fit for, or worthy of." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 4 (2002).	Kraft	A60
13	Pierceable: "capable of being pierced." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 1712 (2002).	Kraft	A61
14	European Patent No. EP1 440 913	Keurig	A62-A111
15	European Patent Application No. 04250384.7 EPO Communication, December 2, 2004.	Keurig	A112-A115
16	European Patent Application No. 04250384.7 Response to EPO Communication, June 9, 2005	Keurig	A116-A125
17	European Patent Application No. 0 272 922	Keurig	A125-A136
18	European Patent Application No. 0 451 980	Keurig	A137-A148
19	U.S. Patent 6,810,788	Kraft	A149-A162

<u>Tab</u>	<u>Description</u>	<u>Party Citing</u>	<u>Page(s)</u>
20	U.S. Patent 6,645,537	Kraft	A162-A170
21	U.S. Patent 6,589,577	Kraft	A171-A177
22	U.S. Patent 6,606,938	Kraft	A178-A185
23	U.S. Patent 5,826,492	Kraft	A186-A202
24	Designed: “done, performed, or made with purpose and intent.” WEBSTER’S THIRD NEW INTERNATIONAL DICTIONARY 612 (2002).	Kraft	A203



US006607762B2

(12) **United States Patent**
Lazaris et al.

(10) Patent No.: **US 6,607,762 B2**
(45) Date of Patent: **Aug. 19, 2003**

(54) **DISPOSABLE SINGLE SERVE BEVERAGE
FILTER CARTRIDGE**

(75) Inventors: Nicholas G. Lazaris, Newton, MA
(US); Roderick H. Beaulieu,
Cumberland, RI (US)

(73) Assignee: Keurig, Incorporated, Wakefield, MA
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 11 days.

(21) Appl. No.: 09/782,665

(22) Filed: Feb. 13, 2001

(65) **Prior Publication Data**

US 2001/0048957 A1 Dec. 6, 2001

Related U.S. Application Data

(60) Provisional application No. 60/183,569, filed on Feb. 18,
2000.

(51) Int. Cl.⁷ B65B 29/02

(52) U.S. Cl. 426/79; 426/113; 426/115;
426/433; 99/295; 99/317; 206/0.5; 206/222

(58) Field of Search 99/293-295, 323,
99/317; 426/77, 79, 81, 433, 435, 106,
113, 115; 206/0.5, 219, 222

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,300,308 A • 4/1994 Louridas 426/112

5,325,765 A 7/1994 Sylvan et al. 99/295

5,431,276 A • 7/1995 Lialin 206/222

5,762,987 A • 6/1998 Fond et al. 426/433

5,840,189 A 11/1998 Sylvan et al. 210/474

5,899,137 A • 5/1999 Miller et al. 99/295

6,007,853 A • 12/1999 Lesser 426/77

* cited by examiner

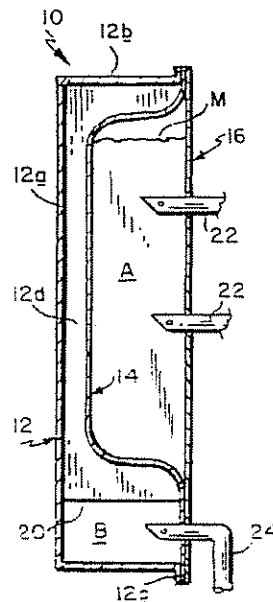
Primary Examiner—Drew Becker

(74) *Attorney, Agent, or Firm*—Samuels Gauthier &
Stevens

(57) **ABSTRACT**

A beverage filter cartridge comprises an outer container with an access opening. A filter element is received in and configured and arranged to subdivide the interior of the container into first and second chambers. A beverage medium is stored in the first chamber. A lid closes the access opening. The lid has a first section overlying the first chamber and a second section overlying the second chamber. The first section of the lid is yieldably pierceable to accommodate an inflow of liquid into the first chamber for infusion with the beverage medium to produce a beverage. The filter element is permeable to accommodate a flow of the beverage from the first chamber into the second chamber, and the second section of the lid is yieldably pierceable to accommodate an outflow of the beverage from the second chamber to the exterior of the cartridge.

10 Claims, 5 Drawing Sheets



U.S. Patent

Aug. 19, 2003

Sheet 1 of 5

US 6,607,762 B2

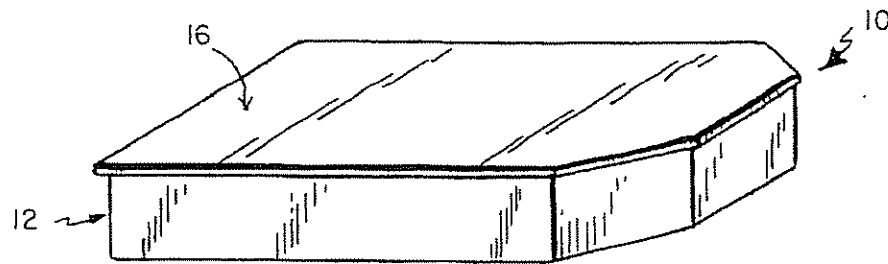


FIG. 1

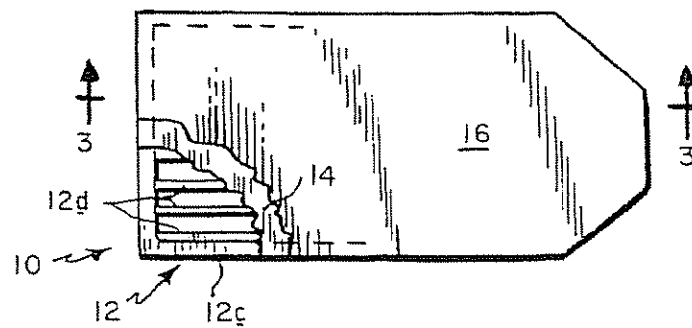


FIG. 2

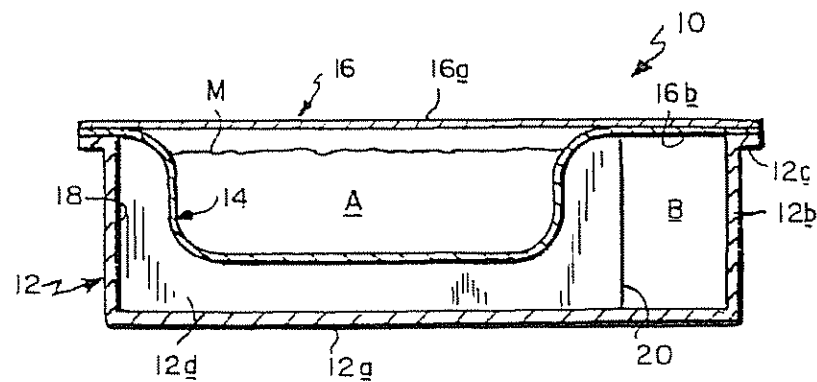


FIG. 3

U.S. Patent

Aug. 19, 2003

Sheet 2 of 5

US 6,607,762 B2

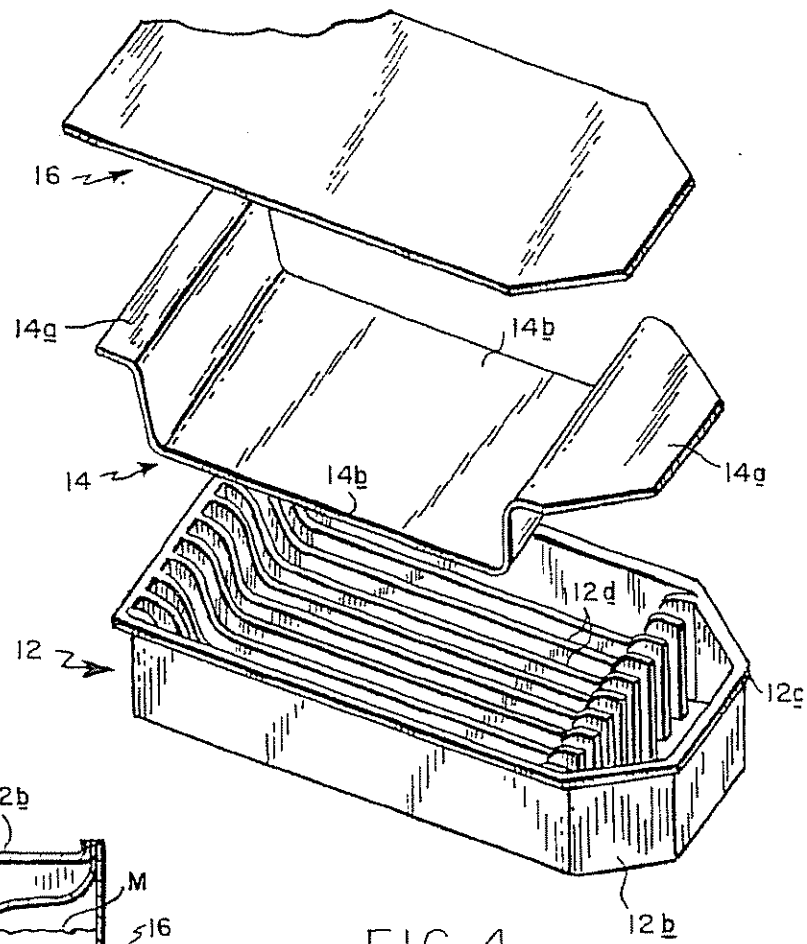


FIG. 4

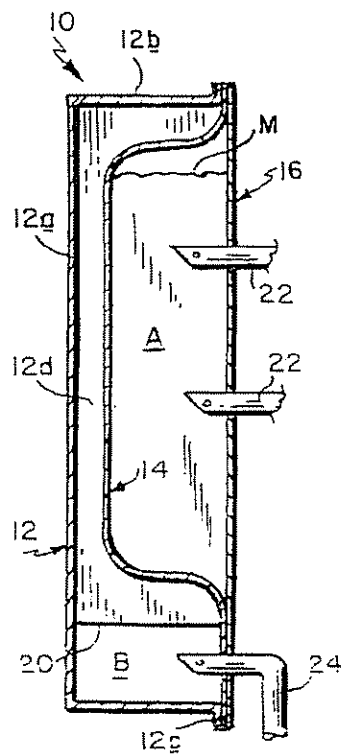


FIG. 5

U.S. Patent

Aug. 19, 2003

Sheet 3 of 5

US 6,607,762 B2

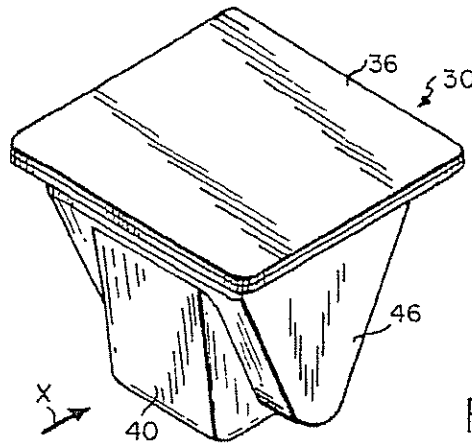


FIG. 6

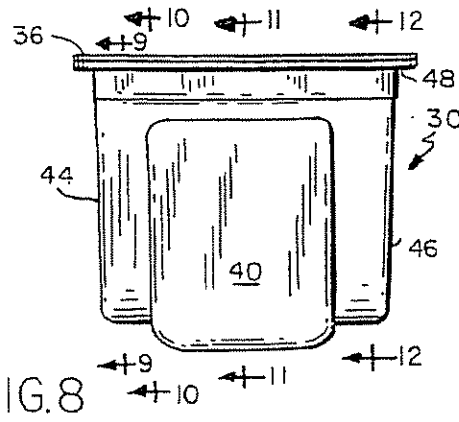
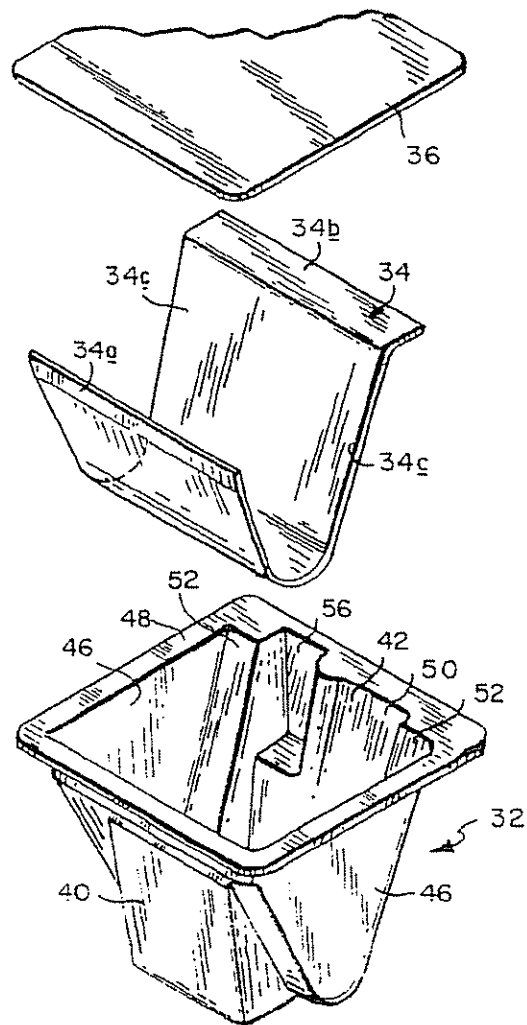


FIG. 8

FIG. 7



U.S. Patent

Aug. 19, 2003

Sheet 4 of 5

US 6,607,762 B2

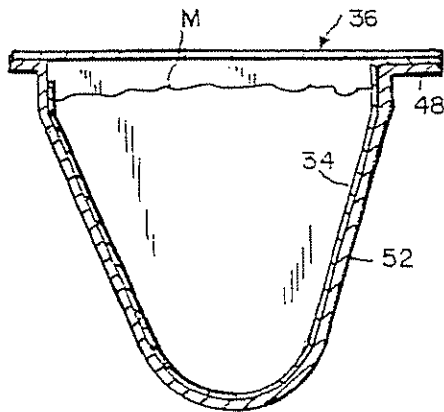


FIG. 9

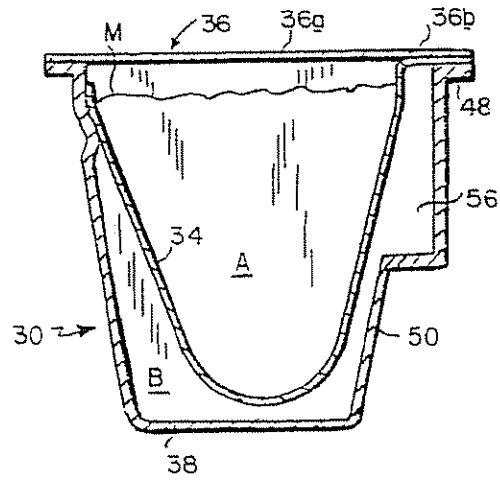


FIG. 10

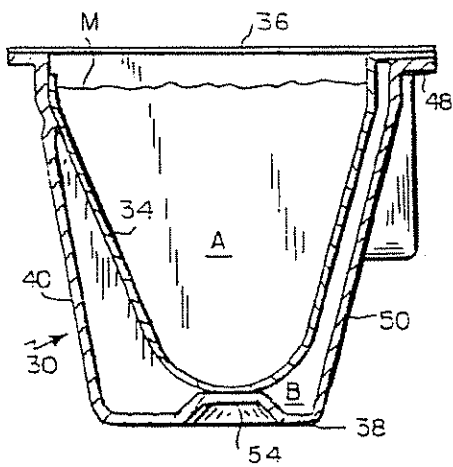


FIG. 11

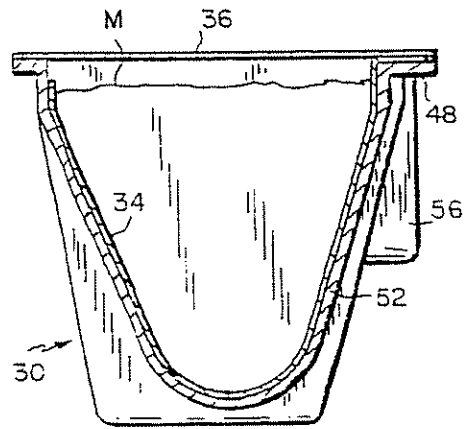


FIG. 12

U.S. Patent

Aug. 19, 2003

Sheet 5 of 5

US 6,607,762 B2

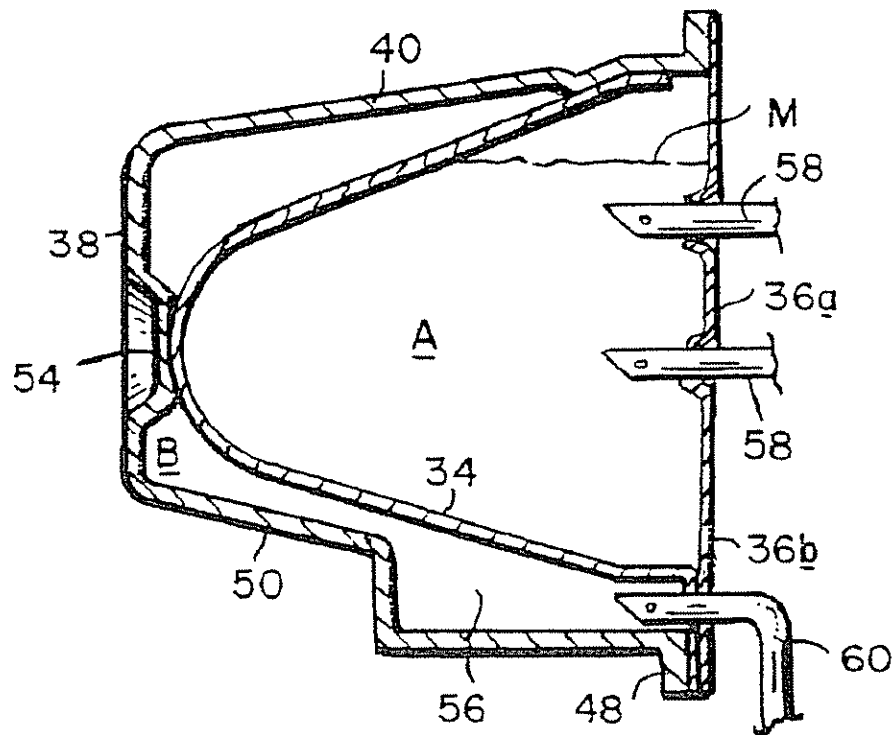


FIG. 13

US 6,607,762 B2

1

**DISPOSABLE SINGLE SERVE BEVERAGE
FILTER CARTRIDGE****CROSS REFERENCES TO RELATED
APPLICATIONS**

This application claims priority from Provisional Patent Application Serial No. 60/183,569 filed Feb. 18, 2000.

FIELD OF THE INVENTION

This invention relates to disposable single serve beverage filter cartridges.

DESCRIPTION OF THE PRIOR ART

A known disposable single serve beverage filter cartridge is disclosed in U.S. Pat. Nos. 5,325,765 and 5,840,189 (Sylvan et al), dated respectively Jul. 5, 1994 and Nov. 24, 1998. This beverage filter cartridge is comprised basically of an impermeable yieldably piercable cup-shaped container thermoformed or injection molded from a relatively rigid plastic material, and internally subdivided by a permeable cone-shaped filter into first and second chambers. A granular or powdered dry beverage medium, e.g., roasted ground coffee, is stored in the first chamber, and the container is closed by an impermeable yieldably piercable lid comprising a laminate of metallic foil and plastic.

During a brewing cycle, the lid and container bottom are pierced from opposite directions, respectively, by tubular inlet and outlet probes. The inlet probe admits heated liquid into the first chamber for infusion with the beverage medium, and the resulting brewed beverage passes through the filter into the second chamber from which it exits via the outlet probe for delivery to an underlying cup.

This known beverage filter cartridge has gained rapid and increasingly widespread acceptance, notwithstanding certain problems and disadvantages relating to its use that have persisted since its initial introduction.

For example, as compared to the lid, the bottom of the cup-shaped container is relatively thick, with a higher resistance to piercing. The bottom cannot easily be thinned without adversely affecting the required thickness of the cup's sidewall to prevent permeability to oxygen and the ability to connect the filter material to the sidewall without damaging the oxygen barrier material. Thus, in the course of being punctured by the outlet probe, the bottom exhibits a tendency to distort inwardly, with an accompanying buckling of the container sidewall. Bottom distortion accompanied by sidewall buckling can adversely affect the puncturing process, resulting in leakage around the outlet probe.

A related problem stems from the need to equip the brewers with expensive metallic outlet probes that can be sharpened to the extent necessary to effect piercing of the more resistant container bottoms, and that can resist wear over prolonged periods of use.

Additionally, some of the brewed liquid beverage is not able to be evacuated because the outlet probe opening is above the bottom of the container and some of the beverage has no means of drainage.

What is needed, therefore, is an improved beverage filter cartridge that obviates or at least significantly minimizes the above-noted problems and disadvantages.

SUMMARY OF THE INVENTION

In accordance with the present invention, a beverage filter cartridge includes an impermeable outer container having an

2

access opening. A planar filter element is configured and arranged to subdivide the container interior into first and second chambers. A beverage medium is stored in the first chamber and an impermeable lid closes the access opening.

The lid has a first section overlying the first chamber and a second section overlying the second chamber. The first and second lid sections are yieldably piercable, respectively, from the same direction, by single or multiple inlet and outlet probes. The inlet probe admits heated liquid into the first chamber for infusion with the beverage medium, and the resulting brewed beverage passes through the filter element into the second chamber, from which it exits via the outlet probe.

The lid material has a lesser resistance to being yieldably pierced as compared to the resistance of the container bottom, and is thus less prone to inward distortion with accompanying buckling of the container sidewall. The net result is a cleaner puncture and an improved seal around the outlet probe.

The relative ease with which the lid may be pierced also makes it possible to equip the brewers with less expensive plastic inlet and outlet probes, in single or multiple configurations.

These and other features and advantages of the present invention will now be described in greater detail with reference to the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of one embodiment of a beverage filter cartridge in accordance with the present invention;

FIG. 2 is a top plan view of the beverage filter cartridge shown in FIG. 1, with portions of the lid and filter element broken away to illustrate details of the container interior;

FIG. 3 is a sectional view on an enlarged scale taken along line 3—3 of FIG. 2;

FIG. 4 is an exploded view of the basic components comprising the beverage filter cartridge shown in FIGS. 1—3;

FIG. 5 is a cross sectional view similar to FIG. 3 showing the lid of the beverage filter cartridge punctured by inlet and outlet probes during a beverage brewing cycle;

FIG. 6 is a perspective view of another embodiment of a beverage filter cartridge in accordance with the present invention;

FIG. 7 is an exploded view of the basic components of the beverage filter cartridge shown in FIG. 6;

FIG. 8 is a side view of the beverage filter cartridge looking in the direction of arrow "X" in FIG. 6;

FIGS. 9, 10, 11 and 12 are sectional view on an enlarged scale taken respectively along lines 9—9, 10—10, 11—11 and 12—12 of FIG. 8; and

FIG. 13 is a sectional view similar to FIG. 10 showing the lid of the beverage filter cartridge punctured by inlet and outlet probes during a beverage brewing cycle.

**DETAILED DESCRIPTION OF ILLUSTRATED
EMBODIMENTS**

Referring initially to FIGS. 1—5, one embodiment of a beverage filter cartridge in accordance with the present invention is generally depicted at 10. The beverage filter cartridge includes an impermeable outer container 12, a permeable filter element 14, and an impermeable lid 16.

The outer container 12 is generally tray-shaped with a bottom wall 12a, a side wall 12b with a flat rim 12c

US 6,607,762 B2

3

surrounding an access opening 13, and a plurality of laterally spaced support ribs 12d projecting upwardly from the bottom wall and extending in parallel relationship in the lengthwise direction of the container.

As shown in FIG. 3, the ribs 12d join the sidewall 12b at 18, curve downwardly and then extend in parallel relationship to the bottom 12a before again curving upwardly to terminate as at 20.

The filter element 14 is formed from sheet material shaped to conform to the shape of the upper edges of the support ribs. The filter element is received in the container 12, with the edges 14a of its front and back ends overlapping and sealed to the rim 12c of the container side wall 12b, and with the edges 14b of its sides overlapping and sealed to outermost ribs 12d which are formed integrally with the container side wall. When thus positioned, the filter element defines a first chamber "A" separate from a second chamber "B", the latter being in communication with open channels separating the support ribs 12d.

A beverage medium "M", typically roasted ground coffee, is loaded into chamber A, after which the lid 16 is sealed to the rim 12c of the container wall 12b (and to any overlapping sealed edge portions of the filter). When thus positioned, the lid has a first section 16a overlying chamber A, and a second section 16b overlying chamber B.

The outer container may be formed, typically by injection molding, from an impermeable heat sealable material.

The filter element 14 may be cut or blanked from any suitably pliable, permeable and yieldably pierceable sheet material, a preferred example being cellulose polypropylene supplied by J. P. Crompton, Ltd. of Bury, Lancashire, England. The lid may be cut or blanked from any suitable impermeable heat sealable and yieldably pierceable material, a preferred example being a metallic/polymer laminate supplied by Heat Seal-Winpak, Ltd. of Montreal, Canada. The lid has less resistance to being yieldably pierced as compared to the outer container, which may or may not be yieldably pierceable.

During a brewing cycle, as shown in FIG. 5, the cartridge can be oriented vertically, and the lid 16 is pierced with one or more tubular infusion probes 22 to admit hot water under pressure into chamber A for infusion with the beverage medium M. The resultant beverage passes through the filter element 14 into the channels defined between the support ribs 12d. From here, the beverage flows downwardly into chamber B from which it is extracted by one or more tubular exit probes 24 which pierce the lid and filter element at a location overlying chamber B. The probes 22, 24 are oriented in the same direction to operate on one side of the cartridge, without piercing the outer container. The soluble beverage medium is completely soaked because the rate of hot water being injected into the container is greater than the outflow rate provided by the outlet probes, resulting in the second chamber B becoming filled with beverage extract and forcing the first chamber A to become completely filled with hot water.

Although not shown, it will be understood that the cartridge may be oriented in other ways than as illustrated in FIG. 5 before, during or after the brewing process.

A second embodiment of a beverage filter cartridge in accordance with the present invention is generally depicted at 30 in FIGS. 6-13. The cartridge components are illustrated separately in FIG. 7, and include an outer container 32, a planar filter element 34, and a lid 36.

The container 32 has a bottom wall 38, a front wall 40, a back wall 42, and side walls 44, 46. The front, back and

4

sidewalls extend upwardly from the bottom wall to a peripheral rim 48 surrounding an upper opening 50.

The side walls 44, 46 are appropriately contoured to define generally V-shaped ledges 52 extending between the front and back walls 40, 42, with the lower portions of the ledges 52 being spaced above the container bottom 38. The bottom 38 is preferably contoured to provide an upwardly protruding centrally located boss 54. The back wall 42 is contoured and the upper rim 48 is recessed to provide a well 56 opening towards the interior of the container.

The filter element 34 has front and back edge regions 34a, 34b, and side edge regions 34c. The filter element is configured, dimensioned and operatively positioned to subdivide the interior of the container into first and second chambers "A", "B", with the well 56 opening into and forming part of chamber B. When the filter element is thus positioned, it will be understood that its side edge regions 34c are secured as by heat sealing to the ledges 52 of the side walls 44, 46, and the front and back edge regions 34a, 34b are similarly secured to the front and back walls 40, 42. Preferably, the bottom of the filter element is also secured as by heat sealing to the upwardly protruding boss 54.

A beverage medium "M" is received through the upper opening 50 and stored in the first chamber A. The upper opening is then closed by securing the lid 36, as by heat sealing, to the peripheral container rim 48.

The outer container may be formed from impermeable heat sealable materials, a preferred example being polyethylenec/EVOH/polystyrene supplied by Curwood Flexible Packaging of Oshkosh, Wis., U.S.A.

The materials from which the filter element 34 and lid 36 are formed may be the same as those described previously for the filter element 14 and lid 16 of the first embodiment.

The lid 36 has a first section 36a overlying chamber A, and a second section 36b overlying the well 56.

As shown in FIG. 13, at the onset of a brewing cycle, the lid section 36a is pierced by one or more inlet probes 58, and the lid section 36b and underlying portion of the filter element are pierced by an outlet probe 60. The inlet probe admits heated liquid into chamber A for infusion with the beverage medium M, and the resulting brewed beverage passes through the filter element into chamber B from which it exits via the outlet probe 60.

It will thus be seen that in both embodiments, the outer container is not pierced. Rather, liquid communication is established with the separate chambers A, B by inlet and outlet probes operating from the same side of the cartridge to pierce different sections of the readily pierceable lid.

Although the outer container and lid have been described as being formed from impermeable materials, it will be understood by those skilled in the art that, alternatively, permeable materials may be employed for one or both of these components. Where permeable materials are employed, the completed cartridges will preferably be subsequently enclosed, either individually or in batches, with impermeable wrappings. Materials for such wrappings are well known, and include for example EVOH films, aluminum foil, etc.

We claim:

1. A beverage filter cartridge comprising:

an outer container having an access opening;

a filter element received in and configured and arranged to subdivide the interior of said container into first and second chambers;

a soluble beverage medium stored in said first chamber; and

US 6,607,762 B2

5

a lid closing said access opening, said lid having a first section overlying said first chamber and a second section overlying said second chamber, the first section of said lid being piercable to accommodate an inflow of liquid into said first chamber for infusion with the beverage medium to produce a beverage, said filter element being permeable to liquid to accommodate a flow of the beverage from said first chamber into said second chamber, and the second section of said lid being piercable to accommodate an outflow of the beverage from said second chamber to the exterior of said cartridge.

2. The beverage filter cartridge of claim 1 wherein said lid has less resistance to being pierced as compared to the resistance to piercing of said container.

3. The beverage filter cartridge of claim 1 wherein said filter element is piercable.

4. The beverage filter cartridge of claim 1 wherein a first section of said filter element coacts with interior surfaces of said container to define said first chamber, and a second section of said filter element underlies the second section of said lid.

5. The beverage filter cartridge of claim 1 wherein said container is provided with a flat rim surrounding and projecting outwardly from said access opening, and wherein edge segments of said filter element overlap and are heat sealed to segments of said rim.

6. The beverage filter cartridge of claim 4 wherein the second sections of both said lid and said filter element are piercable to accommodate the beverage outflow from said second chamber.

6

7. The beverage filter cartridge of claim 1 wherein said filter element comprises a planar sheet of permeable piercable material.

8. The beverage filter cartridge of claim 1 wherein said outer container is impermeable to liquids and gases.

9. The beverage filter cartridge of claim 1 or 8 wherein said lid is impermeable to liquids and gases.

10. A beverage filter cartridge comprising:

an outer container having a access opening;

a planar filter element received in and configured and arranged to subdivide the interior of said container into first and second chambers;

a soluble beverage medium stored in said first chamber; and

a lid closing said access opening, said lid and said outer container being impermeable to liquids and gases, said lid having first section overlying said first chamber and a second section overlying said second chamber, the first section of said lid being piercable to accommodate an inflow of liquid into said first chamber for infusion with the beverage medium to produce a beverage, said filter element being permeable to liquid to accommodate a flow of the beverage from said first chamber into said second chamber, and the and section of said lid being piercable to accommodate an outflow of the beverage from said second chamber to the exterior of said cartridge, said lid having less resistance to being pierced as compared to the resistance to piercing of said container.

* * * * *



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER OF PATENTS AND TRADEMARKS
 Washington, D.C. 20231
 www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/782,665	02/13/2001	Nicholas G. Lazaris	5446	7038

7390 09/24/2002
 Samuels, Gauthier & Stevens LLP
 Suite 3300
 225 Franklin Street
 Boston, MA 02110

EXAMINER

BECKER, DREW E

ART UNIT

PAPER NUMBER

1751

DATE MAILED: 09/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/782,665	LAZARIS ET AL.	
	Examiner	Art Unit	
	Drew E Becker	1761	

AS3

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on 15 October 2001.

2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-9 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-9 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>4</u> .	6) <input type="checkbox"/> Other: _____

Application/Control Number: 09/782,665
Art Unit: 1761

Page 2

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
2. Claims 1-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
3. Claims 1-3 and 6-9 recite components which are "permeable", "impermeable", and "yieldably pierceable". It is not clear what degree of permeability or pierceability are required to meet these limitations, or what type of material is required, since nearly any type of material can be pierced in some fashion and since materials can be permeable to one substance, for instance oxygen, and yet be impermeable to other substances, such as water.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
2. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sylvan et al [Pat. No. 5,840,189] in view of Louridas [Pat. No. 5,300,308].

Application/Control Number: 09/782,665
Art Unit: 1761

Page 3

Sylvan et al teach a beverage filter cartridge comprising a container with an access opening (Figure 1, 12 & 18), a piercable, permeable filter which divides the container into two chambers (Figure 1, 14), a soluble beverage medium in the first chamber (Figure 1, 38), a second chamber which accepts the filtered beverage and the adjacent surface being piercable (Figure 4, 22 & 36), a piercable lid closing the access opening (Figure 4, 16 & 42), a flat rim on which the filter is heat sealed (Figure 5, 32). Sylvan et al do not teach a lid permitting access to both chambers and the container being more resistant to piercing than the lid. Louridas teaches a beverage device comprising two chambers divided by a filter (Figure 1, 10), a lid permitting access to both chambers (Figure 1, #7, 14, 18), and the container being more resistant to piercing than the lid (Figure 1, 21). It would have been obvious to one of ordinary skill in the art to incorporate the two-chamber lid access and non-piercable container of Louridas into the invention of Sylvan et al since both are directed beverage filtering devices, since Sylvan et al already includes a piercable lid and two chambers, and since accessing the two chambers via a single piercable surface would effectively strengthen the cartridge of Sylvan et al due to the sturdier construction of its bottom which would no longer need to be piercable.

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Miller et al [Pat. No. 5,899,137], Lialin [Pat. No. 5,431,276], Lesser [Pat. No. 6,007,853], and Fond et al [Pat. No. 5,762,987] teach beverage filtering devices.

Application/Control Number: 09/782,665
Art Unit: 1761

Page 4

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Drew E Becker whose telephone number is 703-305-0300. The examiner can normally be reached on Monday-Thursday 7am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano can be reached on 703-308-3959. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1495.


Drew Becker
September 23, 2002



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Nicholas G. Lazaris et al. GROUP: 1761
SERIAL NO: 09/782,665 EXAMINER: Drew E. Becker
FILED: 02/13/2001
FOR: DISPOSABLE SINGLE SERVE BEVERAGE FILTER CARTRIDGE

Box Fee Amendment
Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

AMENDMENT

In response to the Office Action mailed on September 24, 2002, please amend the
above-identified application as follows:

RECEIVED
APR 2 2003
TC 1700

03/11/2003 JHALINAH 00000065 09782665
01 TC 0253 465.00 OP

IN THE CLAIMS:

1 1. (Currently Amended) A beverage filter cartridge comprising:
 2 an outer container having an access opening:
 3 a [permeable] filter element received in and configured and arranged to subdivide the
 4 interior of said container into first and second chambers;
 5 a soluble beverage medium stored in said first chamber; and
 6 a lid closing said access opening, said lid having a first section overlying said first
 7 chamber and a second section overlying said second chamber, the first section of said lid being
 8 [yieldably] piercable to accommodate an inflow of liquid into said first chamber for infusion
 9 with the beverage medium to produce a beverage, said filter element being permeable to liquid
 10 to accommodate a flow of the beverage from said first chamber into said second chamber, and
 11 the second section of said lid being [yieldably] piercable to accommodate an outflow of the
 12 beverage from said second chamber to the exterior of said cartridge.

1 2. (Currently Amended) The beverage filter cartridge of claim 1 wherein said lid
 2 has less resistance to being [yieldably] pierced as compared to the resistance to piercing ~~that~~
 3 of said container.

1 3. (Currently Amended) The beverage filter cartridge of claim 1 wherein said
 2 filter element is [yieldably] piercable.

1 4. (Original) The beverage filter cartridge of claim 1 wherein a first section of
 2 said filter element coacts with interior surfaces of said container to define said first chamber,
 3 and a second section of said filter element underlies the second section of said lid.

1 5. (Currently Amended) The beverage filter cartridge of claim 1 wherein said
2 container is provided with a flat rim surrounding and projecting outwardly from[?] said access
3 opening, and wherein edge segments of said filter element overlap and are heat sealed to
4 segments of said rim.

1 6. (Currently Amended) The beverage filter cartridge of claim 4 wherein the
2 second sections of both said lid and said filter element are [yieldably] piercable to
3 accommodate the beverage outflow from said second chamber.

1 7. (Currently Amended) The beverage filter cartridge of claim 1 wherein said
2 filter element comprises a planar sheet of permeable [yieldably] piercable material.

1 8. (Currently Amended) The beverage filter cartridge of claim 1 wherein said
2 outer container is impermeable to liquids and gases.

1 9. (Currently Amended) The beverage filter cartridge of claims 1 or 8 wherein
2 said lid is impermeable to liquids and gases.

1 10. (New) A beverage filter cartridge comprising:
2 an outer container having an access opening;
3 a planar filter element received in and configured and arranged to subdivide the interior
4 of said container into first and second chambers;
5 a soluble beverage medium stored in said first chamber; and
6 a lid closing said access opening, said lid and said outer container being impermeable to
7 liquids and gases, said lid having a first section overlying said first chamber and a second
8 section overlying said second chamber, the first section of said lid being piercable to
9 accommodate an inflow of liquid into said first chamber for infusion with the beverage medium
10 to produce a beverage, said filter element being permeable to liquid to accommodate a flow of
11 the beverage from said first chamber into said second chamber, and the second section of said
12 lid being piercable to accommodate an outflow of the beverage from said second chamber to
13 the exterior of said cartridge, said lid having less resistance to being pierced as compared to
14 the resistance to piercing of said container.

REMARKS

The Office Action of September 24, 2002 and the references cited therein have been carefully considered. The following comments are directed to the Examiner's multiple rejections.

A. §112 REJECTIONS

In the commonly owned U.S. Patent No. 5,840,189 (referenced in the specification at page 2, line 14), the terms "permeable", "impermeable" and "yieldably piercable" were accepted by the PTO as limiting features in the claims. Presumably, therefore, such terms were considered by the PTO as being understood by those skilled in the art, and thus sufficiently definite.

In any event, and in order to expedite favorable consideration, the term "yieldably" has been deleted from the claims, the term "permeable" has been further limited to "liquids", and the term "impermeable" has been likewise further limited to "liquids and gases".

B. §103 REJECTIONS

Currently amended independent claim 1 and newly added independent claim 10 are each directed to a beverage filter cartridge internally subdivided by a permeable filter element into first and second chambers, with a piercable lid overlying both chambers.

In U.S. Patent No. 5,840,189 (Sylvan et al.), the cover 16 overlies the inner chamber 34 but not the outer chamber 36. Thus, to achieve the required circulation of heated liquid through the cartridge, both the lid and the bottom cartridge wall 12b must be pierced respectively by inlet and outlet probes 42, 22. The drawbacks of this arrangement are

REMARKS

The Office Action of September 24, 2002 and the references cited therein have been carefully considered. The following comments are directed to the Examiner's multiple rejections.

A. §112 REJECTIONS

In the commonly owned U.S. Patent No. 5,840,189 (referenced in the specification at page 2, line 14), the terms "permeable", "impermeable" and "yieldably piercable" were accepted by the PTO as limiting features in the claims. Presumably, therefore, such terms were considered by the PTO as being understood by those skilled in the art, and thus sufficiently definite.

In any event, and in order to expedite favorable consideration, the term "yieldably" has been deleted from the claims, the term "permeable" has been further limited to "liquids", and the term "impermeable" has been likewise further limited to "liquids and gases".

B. §103 REJECTIONS

Currently amended independent claim 1 and newly added independent claim 10 are each directed to a beverage filter cartridge internally subdivided by a permeable filter element into first and second chambers, with a piercable lid overlying both chambers.

In U.S. Patent No. 5,840,189 (Sylvan et al.), the cover 16 overlies the inner chamber 34 but not the outer chamber 36. Thus, to achieve the required circulation of heated liquid through the cartridge, both the lid and the bottom cartridge wall 12b must be pierced respectively by inlet and outlet probes 42, 22. The drawbacks of this arrangement are

discussed in the "Description of the Prior Art" presented on pages 2 and 3 of the present specification.

In U.S. Patent No. 5,300,308 (Louridas), a totally different arrangement is disclosed. Here, the package 1 is internally subdivided into upper and lower chambers 5, 7 by an impermeable membrane 6 (See Col. 2, lines 62-63), described as the "key to the overall invention". The upper chamber 5 contains a supply of unheated water, and the lower chamber 7 contains a beverage medium 12 supported on a filter 10.

In operation, outlet and inlet tubes 49, 51 are connected respectively to outlet and inlet openings 15, 17 in a laterally projecting nipple 13. Water drains from the upper chamber 5 via outlet tubing 49 to displace heated water in a boiler (not shown). The heated water, in the form of steam, is fed back via inlet tube 51 to the lower chamber 7 where it condenses on the filter 10 to infuse the beverage medium 12.

It is respectfully submitted that the construction and operational mode of the Louridas package is significantly different from and not properly combinable with the disclosure in Sylvan et al. in order to arrive at the present invention. Subdividing the cartridge of Sylvan et al. with the impermeable membrane of Louridas would result in an unworkable arrangement, as would subdividing the Louridas package with the permeable element of Sylvan et al.

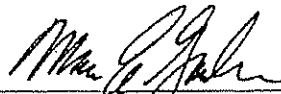
According to well established law, a claim is obvious in view of the combined prior art when the combined prior art together with the knowledge of one of ordinary skill in the art teaches or suggests each limitation of the claim at the time the invention was made. In re Dombiczak, 175 F.3d 994, 998-999 (Fed. Cir. 1999) rev'd on other grounds by In re Gartside, 203 F.3d 1305 (Fed. Cir. 2000). In order to establish that a claim is *prima facie* obvious in

view of the cited prior art, factual evidence, not conclusory statements, must be provided which shows in a clear and particular manner just how the cited prior art teaches or suggests each claim limitation. Id. An obviousness rejection of a claimed invention that is not supported by such factual evidence is susceptible to reversal on the premise that the rejection is improperly based on hindsight reasoning, especially in cases where, as here, the obviousness rejection is of a claimed invention that is not technologically complex. Id. at 999-1000; Ruiz v. A.B. Chance Co., 234 F.3d 654, 664 (Fed. Cir. 2000).

Noticeably absent from Sylvan et al. and Louridas, when viewed either singly or in combination, is any teaching or suggestion of the beverage filter cartridge of the present invention, which includes in combination an outer container internally subdivided by a permeable filter into first and second chambers, with both chambers being closed by a lid that can be pierced at locations overlying both chambers to accommodate the required circulation of heated liquid during a brew cycle.

For at least the foregoing reasons, it is now believed that this application is in condition for allowance.

Respectfully submitted,



Maurice E. Gauthier
Registration No. 20,798
Samuels, Gauthier & Stevens
225 Franklin Street, Suite 3300
Boston, Massachusetts 02110
Telephone: (617) 426-9180
Extension: 113



17619
5446
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Nicholas G. Lazaris et al.
Serial No.: 09/782,665 Group No: 1761
Filed: February 13, 2001 Examiner: Drew E. Becker
For: DISPOSABLE SINGLE SERVE BEVERAGE FILTER CARTRIDGE

Assistant Commissioner of Patents
Washington, D.C. 20231

AMENDMENT TRANSMITTAL

1. Transmitted herewith is an amendment for this application.

STATUS

2. Applicant is
☒ a small entity - verified statement:
— attached.
☒ already filed.
— other than a small entity.

RECEIVED
APR 2 2003
TC-1700

CERTIFICATE OF MAILING (37 CFR 1.8(a))

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United State Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Donna M. Tomaso
(Type or print name of person mailing letter)

March 20, 2003
Date

(Signature of person mailing paper)

Page 1 of 4

A

EXTENSION OF TERM

NOTE: "Extension of Time in Patent Cases (Supplement Amendments)—If a timely and complete response has been filed after a Non-Final Office Action, an extension of time is not required to permit filing and/or entry of an additional amendment after expiration of the shortened statutory period.

If a timely response has been filed after a Final Office Action, an extension of time is required to permit filing and/or entry of a Notice of Appeal or filing and/or entry of an additional amendment after expiration of the shortened statutory period unless the timely-filed response placed the application in condition for allowance. Of course, if a Notice of Appeal has been filed within the shortened statutory period, the period has ceased to run." Notice of December 10, 1985 (1061 O.G. 34-35).

NOTE: See 37 CFR 1.645 for extensions of time in interference proceedings and 37 CFR 1.550(e) for extensions of time in reexamination proceedings.

3. The proceedings herein are for a patent application and the provisions of 37 CFR 1.136 apply.

(complete (a) or (b) as applicable)

(a) X Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

Extension (months)	Fee for other than <u>small entity</u>	Fee for <u>small entity</u>
— one month	\$ 110.00	\$ 55.00
— two months	\$ 400.00	\$200.00
<u>X</u> three months	\$ 930.00	\$465.00
— four months	\$1,440.00	\$720.00
— fifth month	\$1,960.00	\$980.00
	Fee \$	<u>\$465.00</u>

If an additional extension of time is required please consider this a petition therefor.
(check and complete the next item, if applicable)

— An extension for _____ months has already been secured and the fee paid therefor of
\$ _____ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request \$

OR

(b) — Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition for extension of time.

Page 2 of 4

A

FEE FOR CLAIMS

4. The fee for claims (37 CFR 1.16(b)-(d)) has been calculated as shown below:

(Col. 1)		(Col. 2)		(Col. 3)		SMALL ENTITY		OTHER THAN A SMALL ENTITY	
CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOREXTRA		PRESENT ADDIT. RATE	FEE	OR	RATE	ADDIT. FEE	
TOTAL 10		MINUS 20	=	0	x 9= \$0.00		x 18=	\$0.00	
INDEP. 2		MINUS 3	=	0	x 42= \$0.00		x 84=	\$0.00	
FIRST PRESENTATION OF MULTIPLE DEP. CLAIM					+140=	\$	+280=	\$0.00	
					TOTAL ADDIT. FEE	\$	OR FEE	TOTAL ADDIT. FEE	\$0.00

If the entry in Col. 1 is less than entry in Col. 2, write "0" in Col. 3.
 If the "Highest No. Previously Paid For" IN THIS SPACE is less than 20, enter "20".
 If the "Highest No. Previously Paid For" IN THIS SPACE is less than 3, enter "3".
 The "Highest No. Previously Paid For" (Total or Indep.) is the highest number found in the
 appropriate box in Col. 1 of a prior amendment or the number of claims originally filed.

WARNING: "After final rejection or action (1.113) amendments may be made cancelling claims or complying with any requirement of form which has been made." 37 CFR 1.116(a) (emphasis added).

(complete (c) or (d) as applicable)

- (c) ☒ No additional fee for claims is required.

OR

- (d) ☐ Total additional fee for claims required \$0.00

FEE PAYMENT

5. ☒ Attached is a check in the sum of \$ 465.00

☐ Charge Account No. _____ the sum of \$ _____

A duplicate of this transmittal is attached.


FEE DEFICIENCY

NOTE: If there is a fee deficiency and there is no authorization to charge an account, additional fees are necessary to cover the additional time consumed in making up the original deficiency. If the maximum, six-month period has expired before the deficiency is noted and corrected, the application is held abandoned. In those instances where authorization to charge is included, processing delays are encountered in returning the papers to the PTO Finance Branch in order to apply these charges prior to action on the cases. Authorization to charge the deposit account for any fee deficiency should be checked. See the Notice of April 7, 1986, (1065 O.G. 31-33).

6. X If any additional extension and/or fee is required, charge Account No. 19-0079

AND/OR

X If any additional fee for claims is required, charge Account No. 19-0079


SIGNATURE OF ATTORNEY

Reg. No.: 20,798

Maurice E. Gauthier
Type or print name of attorney

Tel. No.: (617) 426-9180
Extension 113

Samuels, Gauthier & Stevens
225 Franklin Street, Suite 3300
P.O. Address

Boston, Massachusetts 02110

Notice of Allowability	Application No.	Applicant(s)	
	09/762,665	LAZARIS ET AL.	
	Examiner	Art Unit	
	Drew E Becker	1761	

HG

– The MAILING DATE of this communication appears on the cover sheet with the correspondence address–

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed March 26, 2003.
2. ☒ The allowed claim(s) is/are 1-10.
3. ☐ The drawings filed on _____ are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____

5. ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 - (a) ☐ The translation of the foreign language provisional application has been received.
6. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

7. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
8. ☒ CORRECTED DRAWINGS must be submitted.
 - (a) ☒ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☒ hereto or 2) ☐ to Paper No. _____.
 - (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the Examiner.
 - (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet.

9. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1 <input type="checkbox"/> Notice of References Cited (PTO-892) 3 <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) 5 <input type="checkbox"/> Information Disclosure Statements (PTO-1449), Paper No. _____ 7 <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material	2 <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) 4 <input type="checkbox"/> Interview Summary (PTO-413), Paper No. _____ 6 <input type="checkbox"/> Examiner's Amendment/Comment 8 <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance 9 <input type="checkbox"/> Other
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Application/Control Number: 09/782,665
Art Unit: 1761

Page 2

DETAILED ACTION

Allowable Subject Matter

1. Claims 1-10 are allowed.
2. The following is an examiner's statement of reasons for allowance: the beverage filter cartridge of independent claims 1 and 10 define over the prior art of record since the prior art does not teach, suggest, nor render obvious a piercable lid with a first section overlying the first chamber to accommodate inflow of liquid for infusion and a second section overlying the second chamber to accommodate outflow of the beverage.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Drew E Becker whose telephone number is 703-305-0300. The examiner can normally be reached on Monday-Thursday 8am-6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano can be reached on 703-308-3959. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Application/Control Number: 09/782,665

Page 3

Art Unit: 1761

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1495.



Drew E Becker
Examiner
Art Unit 1761

June 3, 2003

02-22-00

Please type a plus sign (+) inside this box

+

Docket No. 5446

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

APPROV.

INVENTOR(S)				
Given Name (first and middle (if any))	Family Name or Surname	Residence (City and either State or Foreign Country)		
Nicholas G.	Lazaris	1947 Beacon Street Newton, MA 02468		
Roderick H.	Beaulieu	196 Hines Road Cumberland, RI 02864		
____ Additional inventors are being named on the additional page attached hereto.				
TITLE OF THE INVENTION (280 characters max)				
BEVERAGE FILTER CARTRIDGE				
CORRESPONDENCE ADDRESS				
Direct all correspondence to:		<div style="border: 1px solid black; padding: 5px; text-align: center;"> Place Customer Number Bar Code Label here </div>		
____ Customer Number Type Customer Number here				
OR				
<input checked="" type="checkbox"/> Firm or Individual Name	Maurice E. Gauthier c/o Samuels, Gauthier & Stevens, LLP			
Address	225 Franklin Street, Suite 3300			
City, State & ZIP	Boston, Massachusetts 02110			
Country	U.S.	Tel.	(617) 426-9180	Fax (617) 426-2275
ENCLOSED APPLICATION PARTS (check all that apply)				
<input checked="" type="checkbox"/> Specification	Number of Pages	4	<input type="checkbox"/> Small Entity Statement	
<input checked="" type="checkbox"/> Drawing(s)	Number of Sheets	2	<input type="checkbox"/> Other (specify)	
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (check one)				
<input type="checkbox"/> A check or money order is enclosed to cover the filing fees.			FILING FEE	
<input checked="" type="checkbox"/> No fee is to be paid at this time.			AMOUNT	
<input type="checkbox"/> The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Order Account Number: 19-0079			\$ _____	
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.				
<input checked="" type="checkbox"/> No.				
<input type="checkbox"/> Yes, the name of the U.S. Government agency and the Government contract number are: _____				

CERTIFICATION UNDER 37 C.F.R. 1.10

I hereby certify that this correspondence and the documents referred to as attached therein are being deposited with the United States Postal Service on February 18, 2000 in an envelope as "EXPRESS MAIL POST OFFICE TO ADDRESSEE" service under 37 C.F.R. 1.10, Mailing Label Number _____ addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

EL489804118US



Signature

Elizabeth A. Dooley

Type or print name of person certifying

Respectfully submitted,

Signature Maurice E. Gauthier
Typed or Printed Name: Maurice E. Gauthier
Registration No.: 20,798
Telephone: (617) 426-9180
Extension: 113

Date: 2/15/08

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

+

5446
N-Cup

PROVISIONAL PATENT APPLICATION
OF
NICHOLAS G. LAZARIS
AND
RODERICK H. BEAULIEU
FOR
BEVERAGE FILTER CARTRIDGE

5446
N-Cup

This invention relates generally to beverage filter cartridges of the type described in U.S. Patent No. 5,840,189, the disclosure of which is herein incorporated by reference.

A preferred embodiment of the invention is disclosed in the accompanying drawings,
5 wherein:

Figure 1 is a top plan view of the beverage filter cartridge;

Figure 2 is a longitudinal sectional view taken along line 2-2 of Figure 1;

Figure 3 is an exploded perspective view of the filter cartridge components; and

Figure 4 is a view similar to Figure 2 showing the beverage filter cartridge in use during a
10 brewing cycle.

Referring now to the drawings, a beverage filter cartridge in accordance with the present invention is generally depicted at 10. The cartridge includes an outer container 12, a filter element 14 and a lid 16.

15 The outer container 12 is generally tray-shaped, with a bottom wall 12a, a side wall 12b, and a series of laterally spaced support ribs 12c projecting upwardly from the bottom wall and extending in parallel relationship in the lengthwise direction of the container.

As can be best seen in Figure 2, the ribs 12c join the side wall 12 as at 18, and curve downwardly and then extend in parallel relationship to the bottom wall before again curving
20 upwardly to terminate as at 20, thereby forming an open exit chamber B.

The filter element 14 is formed from sheet material shaped to conform to the shape of the upper edges of the support ribs. The filter element is received in the container 12, with the edges 14a of its ends overlapping and sealed to the upper edge of the container side wall 12b, and with the edges 14b of its sides overlapping and sealed to outermost ribs 12c which project integrally

5446
N-Cup

from the container side wall. When thus positioned, the filter element defines an inner chamber A separate from the exit chamber B.

A beverage extract, typically ground coffee, is loaded into chamber A, after which the lid 16 is sealed to the upper edge of the container wall 12b (and over any overlapping sealed edge portions of the filter).

The outer container 12 and lid 16 are impermeable, with the latter additionally being yieldably piercable. The filter element 14 is permeable.

During a brewing cycle, as shown in Figure 4, the cartridge is oriented vertically, and the lid 16 is pierced with one or more tubular infusion needles 22 to admit hot water under pressure into chamber A for infusion into the coffee contained therein. The resultant beverage passes through the filter 14 into the channels defined between the support ribs 12c. From here, the beverage flows downwardly into chamber B from which it is extracted by one or more tubular exit needles 24 which pierce the lid at a location overlying chamber B.

The generally rectangular and flat configuration of the cartridge offers a number of advantages. For example, both inlet and exit piercing can be achieved through the lid 16 on the same side of the cartridge.

- This allows for more economical piercing methods since the lid is easier to puncture than the outer container.
- Multiple inlet punctures allow for more thorough wetting of extract material.
- The cartridge is easier to handle/package/vend.

Other advantages include:

- Forming the filter by simple bending from a planar sheet, making manufacturing easier and more economical.

5446
N-Cup

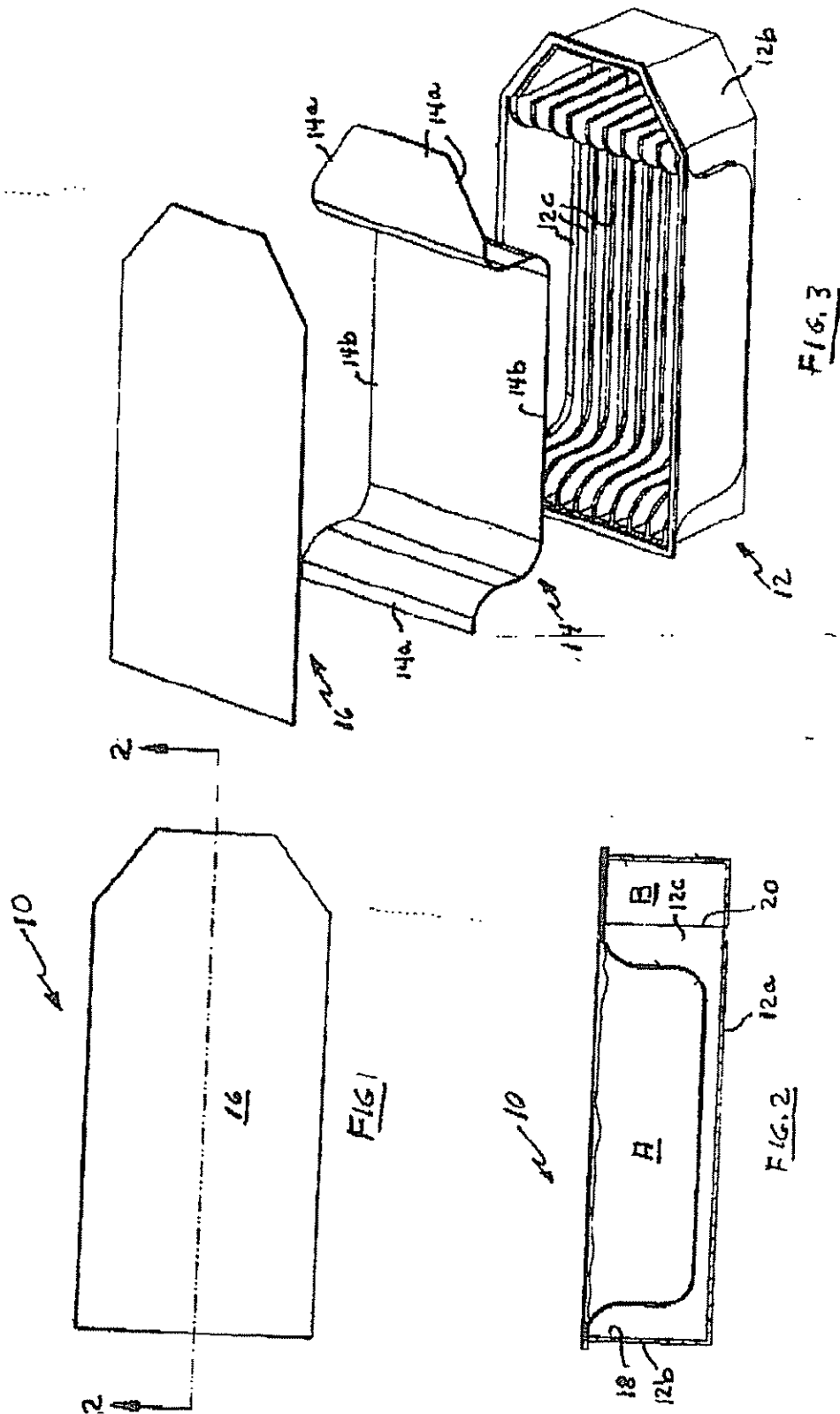
- Improved drainage of the brewed beverage via the channels formed between the support ribs 12c.
- The non-extract chamber volume B of the cartridge is minimized, increasing the longevity of the extract by minimizing the potential for oxygen content. The increased coffee/ total volume ratio is >70% vs. <60% with current cartridges of the type disclosed in the above-references '189 patent.
- "Extract" chamber volume A of the cartridge is increased from ~1.8 cu. in. to ~3.2 cu. in., providing an increased range of beverage concentrations that can be brewed.

10 In light of the foregoing, those skilled in the art will appreciate that the filter element can be formed from paper, plastic, etc. Likewise, the outer container can be formed of plastic, metals such as aluminum, and other moldable materials, and the lid may also be formed of any available impermeable yieldably pierceable material, including metallic foils, plastics, coated papers, etc.

15 Exterior surfaces of the cartridge may be provided with machine readable features identifying the type of extract, the particular brewing cycle to be employed, etc.

As herein employed, the term "beverage extract" includes an extract or pulverulent substance for the preparation of a beverage, which can be ground roast coffee, tea, instant coffee, a chocolate-type product or any dehydrated edible substance.

5446



5446

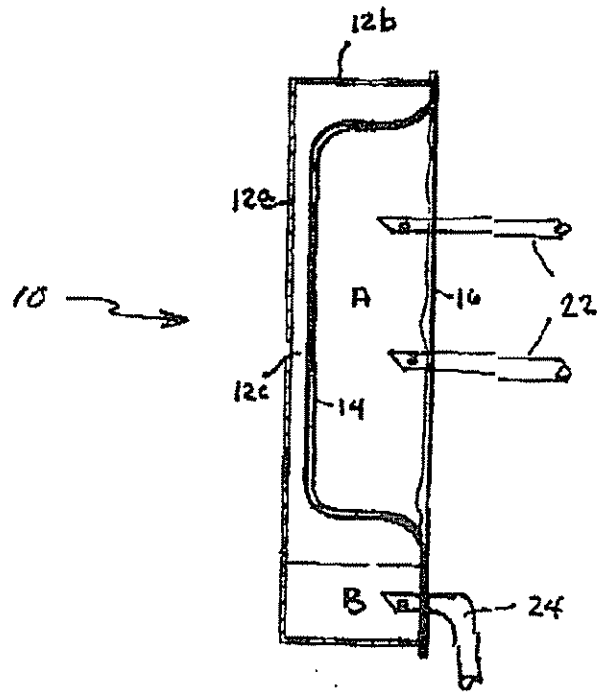


FIG. 4



US005840189A

United States Patent [19]

Sylvan et al.

[11] Patent Number: **5,840,189**[45] Date of Patent: **Nov. 24, 1998**[54] **BEVERAGE FILTER CARTRIDGE**[75] Inventors: **John E. Sylvan, Brookline; Peter B. Dragone, Concord, both of Mass.**[73] Assignee: **Keurig, Inc., Waltham, Mass.**[21] Appl. No.: **914,955**[22] Filed: **Aug. 20, 1997****Related U.S. Application Data**

[63] Continuation of Ser. No. 527,770, Sep. 13, 1995, abandoned, which is a continuation-in-part of Ser. No. 192,409, Feb. 4, 1994, abandoned, which is a division of Ser. No. 945,746, Sep. 16, 1992, Pat. No. 5,325,765.

[51] Int. Cl.⁶ **B01D 27/00; B01D 29/085; B65B 29/02**[52] U.S. Cl. **210/474; 210/233; 210/497.01; 210/497.3; 99/295; 99/302 R; 99/317; 426/77; 426/433; 426/435**[58] Field of Search **426/77, 78, 79, 426/80, 81, 82, 473, 477, 479, 482, 435, 112, 433; 99/279, 295, 300, 302 R, 302 P, 304, 306, 307, 316, 317, 321; 210/473, 474, 484, 488, 492, 497.3, 233, 497.01**[56] **References Cited****U.S. PATENT DOCUMENTS**

240,402 4/1881 Gee .
 346,278 7/1886 Halstead .
 370,141 9/1887 Hobbs .
 845,968 3/1907 Murray .
 1,168,544 1/1916 Newlin .
 1,302,483 4/1919 Vierling .
 2,997,940 8/1961 Pecoraro et al. .
 3,144,495 8/1964 Makowski 264/248
 3,199,682 8/1965 Scholtz .
 3,579,351 5/1971 Wege et al. .
 3,615,708 10/1971 Abile-Gal .
 3,812,273 5/1974 Schmidt .

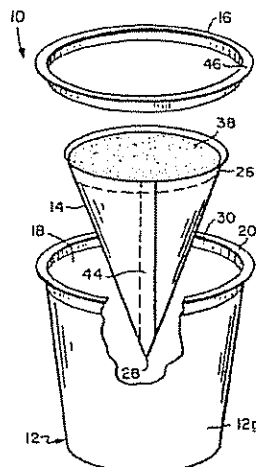
3,971,305 7/1976 Daswick .
 4,136,202 1/1979 Favre 426/77
 4,204,966 5/1980 Morgan, Jr. .
 4,321,139 3/1982 Auclair .
 4,389,925 6/1983 Plana .
 4,417,504 11/1983 Yamamoto .
 4,446,158 5/1984 English et al. .
 4,584,101 4/1986 Kataoka .
 4,818,544 4/1989 Seward 426/77
 4,859,337 8/1989 Woltermann .
 4,860,645 8/1989 van der Lijn et al. .
 4,886,674 12/1989 Seward et al. 426/77
 4,981,588 1/1991 Poulallion .
 4,995,310 2/1991 van der Lijn et al. .
 5,242,702 9/1993 Fond 426/77
 5,325,765 7/1994 Sylvan et al. 426/77
 5,424,083 6/1995 Lozito 426/77
 5,472,719 12/1995 Favre 426/77

FOREIGN PATENT DOCUMENTS

1248283 11/1960 France 426/79
 2556323 6/1985 France 426/77
 2327264 1/1975 Germany 426/77

Primary Examiner—Robert J. Popovics*Attorney, Agent, or Firm*—Samuels, Gauthier, Stevens & Reppert[57] **ABSTRACT**

A beverage filter cartridge includes an impermeable yieldably pierceable base having a predetermined shape and an access opening at one end. A self-supporting wettable filter element is disposed in the base and is permanently sealed to an interior surface of the base. The filter element subdivides the base into first and second chambers, a first chamber for storing an extract of the beverage to be made, and a second empty chamber for accessing the beverage after the beverage outflow from the filter has been made by combining a liquid with the extract. An impermeable, yieldably pierceable, imperforate cover is sealingly engaged with the top of the base to form an impermeable cartridge.

6 Claims, 2 Drawing Sheets

U.S. Patent

Nov. 24, 1998

Sheet 1 of 2

5,840,189

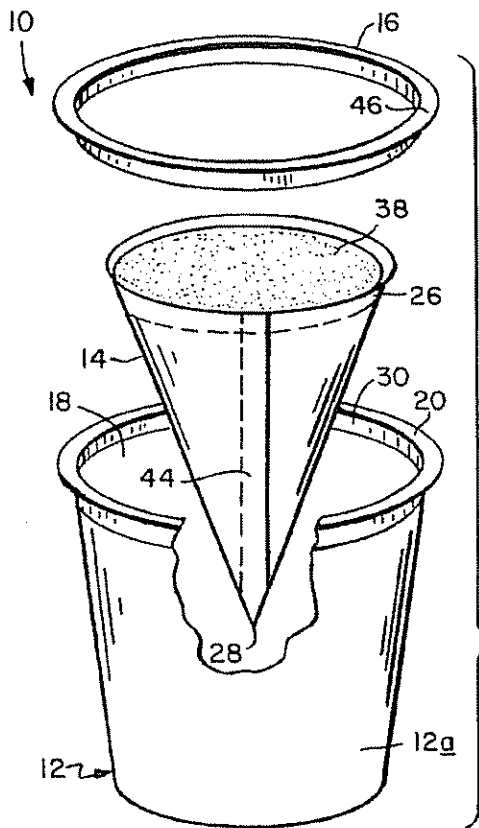


FIG. 1

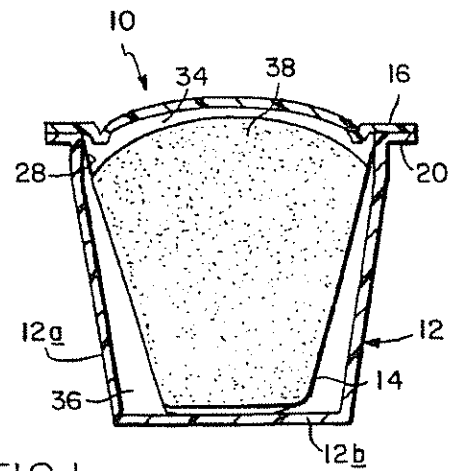


FIG. 2

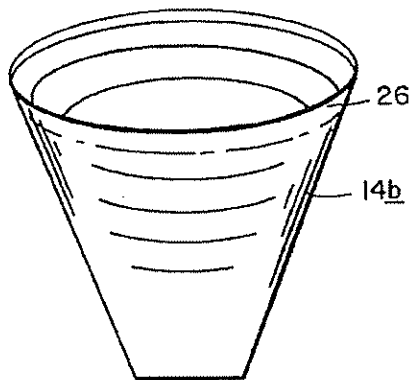


FIG. 3B

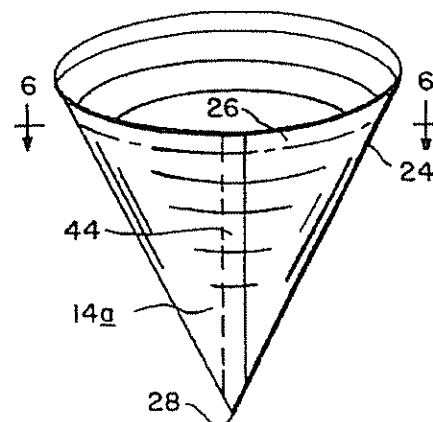


FIG. 3A

U.S. Patent

Nov. 24, 1998

Sheet 2 of 2

5,840,189

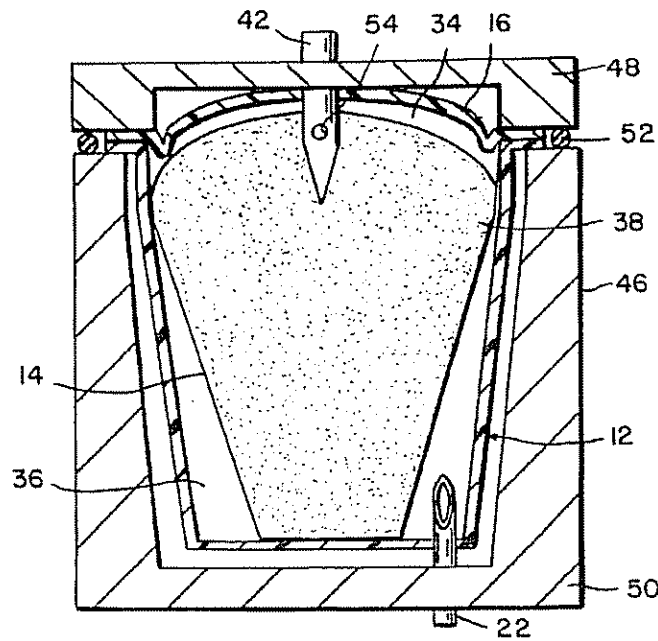


FIG. 4

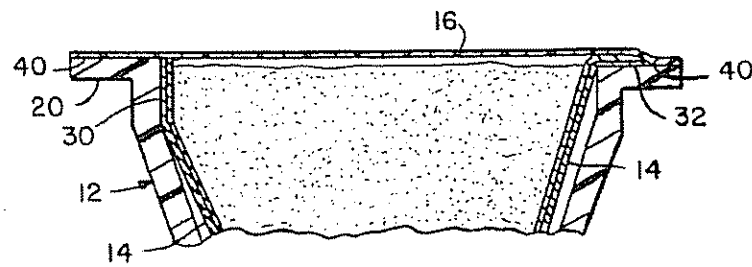


FIG. 5

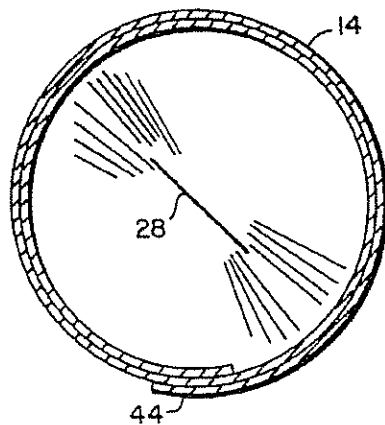


FIG. 6

5,840,189

1

BEVERAGE FILTER CARTRIDGE**CROSS REFERENCES TO RELATED APPLICATIONS**

This is a continuation of application(s) Ser. No. 08/527,770 filed on Sep. 13, 1995 now abandoned, which is a continuation-in-part of Ser. No. 08/192,409 filed on Feb. 4, 1994, now abandoned, which is a divisional application of Ser. No. 07/945,746 filed on Sep. 16, 1992 now U.S. Pat. No. 5,325,765.

FIELD OF INVENTION

This invention relates to an imperforate beverage filter cartridge which is adapted to hermetically contain a beverage extract and which is yieldably pierceable, both to accommodate an injection of liquid into the cartridge for combination with the extract to produce a beverage, and to accommodate an outflow of the beverage.

DESCRIPTION OF THE PRIOR ART

There are a number of schemes for providing devices for making a single beverage server, such as a cup of coffee or tea. In one approach a disposable container fits on top of a cup and has a compartment for receiving a beverage extract such as coffee with a large reservoir on top into which a person must pour boiling water. These devices are disposable but expensive, the coffee is exposed to the air where it can easily get stale or contaminated, and they are not generally suitable for automatic coffee making or other beverage machines. Since the flow rate of beverage is generally slow, these devices are typically large relative to the volume of beverage dispensed. In addition, since these devices are designed to be used upright, only the bottom area is available for filtration flow and this contributes to the slowness of the filtration process. Attempts to overcome these shortcomings have met with indifferent success. In one construction a filter is provided in a sealed receptacle but included intermediate the receptacle and filter is a support member which functions to support the filter. When the filter is wetted it sags and conforms with the support member which has a hole in it to release the filtered beverage but otherwise blocks the output of the filter. Such a filter design used in an application where water is injected under pressure would provide low flow rates.

A general objective of the present invention is to provide an improved beverage filter cartridge which is small and compact yet has a high flow rate.

It is a further object of this invention to provide an improved beverage filter cartridge which is simple and has very few parts so it can be disposed of after a single use.

It is a further object of this invention to provide such an improved beverage filter cartridge whose filter is self-supporting and does not collapse against the container even when wetted.

It is a further object of this invention to provide an improved imperforate beverage filter cartridge which is hermetically sealed for freshness and against contamination.

It is a further object of this invention to provide an improved imperforate beverage filter cartridge which can be yieldably pierced for input and output flow without puncturing the filter.

It is a further object of this invention to provide an improved beverage filter cartridge which maintains its integrity and that of the filter even when the cartridge is dually penetrated for inflow and outflow.

2

It is a further object of this invention to provide an improved beverage filter cartridge which even when the filter is wetted maintains a substantial volume between the filter and cartridge for safely receiving a penetrator and for enhancing filter flow-through.

SUMMARY OF INVENTION

The beverage filter cartridge of the present invention includes an impermeable imperforate hollow base closed at one end and having an access opening at the opposite end, with a self-supporting filter element permanently joined to an interior surface of the base. The filter is configured and dimensioned to divide the base into first and second chambers. A beverage extract is stored in the first chamber. An impermeable and imperforate cover is permanently joined in a hermetically sealed relationship to the base to close the access opening. Both the cover and base are yieldably pierceable, the cover to accommodate an injection of liquid into the first chamber for combination with the extract to produce a beverage, and the base to accommodate the outflow of the beverage from the second chamber.

In an alternative embodiment the cover may be domed convexly outward. The access opening of the base may include a flange and the cover may include a mating flange which establish the sealing engagement of the base and cover. The domed cover convexity may extend outwardly beyond the opening of the base. The filter and the base may both generally be truncated, non-congruent cones. The filter may be generally a cone shape and the base may be truncated cone shape. The filter may be a triangular prism with a circular base and the base may be truncated cone shape. The base may be made of polystyrene, ethylene vinyl alcohol, and polyethylene. The cover may be made of the same material. The filter may be made of a lightweight, two-phase heat-sealable paper of cellulosic synthetic fibers. These synthetic fibers may be PVC or polypropylene. The filter element may terminate in a reduced apex portion spaced from the bottom of the base to define an enlarged second chamber for receiving the piercing element in the lower portion of the base without subjecting the filter element to penetration.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages will occur to those skilled in the art from the following description of a preferred embodiment and the accompanying drawings, in which:

FIG. 1 is a three-dimensional exploded view of a beverage filter cartridge according to this invention with a portion of the base broken away;

FIG. 2 is a vertical sectional view of the cartridge of FIG. 1 shown in an assembled state;

FIG. 3A is a perspective view of the filter of FIGS. 1 and 2;

FIG. 3B is a view similar to FIG. 3A of an alternative truncated conical shaped filter;

FIG. 4 is a view showing the beverage filter cartridge installed in a brewing machine;

FIG. 5 is an enlarged split cross-section of the upper portion of a beverage filter cartridge illustrating alternative embodiments of the cartridge; and

FIG. 6 is a sectional view taken along line 6-6 of FIG. 3A.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated the beverage filter cartridge 10 of the present invention includes an impermeable, imperforate,

5,840,189

3

yieldably pierceable hollow base 12, a filter element 14 and an impermeable imperforate yieldably pierceable cover 16. The base is preferably cup-shaped, with a gradually tapering truncated conical side wall 12a closed at one end by a substantially flat bottom wall 12b and defining a circular access opening 18 at the opposite end. The sidewall includes a radially outwardly protruding lip surrounding the access opening. The base 12 is typically formed from a polymeric laminate. One example of a base material is Product No. C150 available from Wapak Portion Pack of Bristol, Pa. This material is a coextruded composite barrier sheet consisting of polystyrene, polyethylene, EVOH and adhesive. The barrier sheet is then thermoformed into the shape of a cup. The techniques for forming the sheet and cup are well known in the art. The base 12 is yieldably pierceable with an instrument such as a needle 22 or other penetrator to provide an exit for a beverage to be dispensed.

A self-supporting wettable filter element 14 is disposed in the base 12 and is permanently joined to an interior surface of the side wall 12a of the base. The filter is preferably in the shape of an inverted hollow cone 24 having a curved wall tapering evenly from a circular rim 26 surrounding an open upper end to a closed lower end as shown in FIG. 3A. The filter element 14 is placed in the base 12 so that the apex 28 of the cone 24 is supported on and slightly flattened by the bottom wall 12b of the base 12. This enlarges the volume within the cone and provides beneficial support for the filter element 14.

As depicted by the left-hand portion of FIG. 5, preferably the circular rim 26 of the filter element 14 is heat sealed to the interior of the side wall 12a of the base 12 at a location 30 adjacent to the access opening 18. Alternatively, as depicted at the right-hand portion of FIG. 5, the rim 26 of the filter element 14 can be heat sealed as at 32 to a portion of the lip 20 of the base 12.

The filter element 14 is configured and dimensioned to divide the base into two chambers 34, 36. In the first chamber 34, an extract 38 of the beverage that is to be made, such as coffee, is stored. Because the filter 14 is flattened on the bottom of the base, a considerably greater amount of extract 38 can be accommodated by the filter 14. The second chamber 36 has a volume for accessing the beverage outflow through the filter 14 after the beverage has been made by combining liquid with the extract 38. There is ample room in the second chamber 36 so that a penetrator 22 which yieldably pierces the base 12 will not rupture or otherwise deform the filter 14.

A yieldably pierceable impermeable and imperforate cover 16 is permanently joined as at 40 in a hermetically sealed relationship with the lip of the base 12, closing the opening 18 to form an imperforate, impermeable cartridge 10. The cover 16 is yieldably pierceable with an instrument such as a tubular needle 42 or other penetrator through which hot water is delivered for combination with the extract 38 in the first chamber 34. The cover 16 is preferably a laminate of nylon, aluminum and a heatseal lacquer used to bond the aluminum to the polyethylene of the base. A typical cover material is 15 micron OPA/ADH/20 micron ALU/LPP75 supplied by Hueck Foils, Inc., of Eatontown, N.J. The cover 16 is die cut to a size equal to or slightly smaller than that of the lip 20 of the base 12.

The filter element 14 may be made of a lightweight, two-phase heat sealable paper of cellulosic and synthetic fibers such as the "Superseal" Teabag Paper supplied by J. R. Crompton's of Gainesville, Ga. The synthetic fibers may be PVC or polypropylene so that they are compatible with

4

the material of the base and are therefore easily sealed to the base using heat, ultrasonic energy or microwave energy. In addition, the material of the filter is such that the filter 14 is totally self-supporting. Even when the filter 14 is wetted, it will not collapse or sag against the inner wall 12a of the base 12.

The filter element 14 is die cut from a sheet of material to include three quarters of a circle and then rolled twice to form a double-walled cone in which the edges are heat sealed along seam 44 to the overlapping portion of the filter element. The double-walled configuration of the cone can best be seen in FIG. 6. The filter element 14 can also be formed into a truncated cone, see FIG. 3B, or a triangular prism which fans out and blends into a circular base, however, these shapes are more costly to form.

As illustrated in FIG. 4, cartridge 10 is well adapted for use in an automatic machine such as a coffee brewing machine where it will be delivered to and gripped in a housing 46 having an upper part 48 and a lower part 50 sealingly engaged at seal 52 by a portion of the machine not shown. Upper part 48 includes a penetrator or needle 42 which yieldably penetrates cover 16 to provide pressurized hot water through hole 54 to coffee extract 38 in filter 14. A second penetrator or needle 22 is yieldably pushed through the bottom 12b of base 12 to receive the outflow of the coffee beverage and dispense it to a cup or container.

In the coffee packaging industry, before sealing the package it is standard practice to replace the oxygen in the package with nitrogen. This practice may be included in the manufacturing of the beverage filter cartridge disclosed herein.

Although specific features of the invention are shown in some drawings and not others, this is for convenience only as some feature may be combined with any or all of the other features in accordance with the invention.

The foregoing description has been limited to a specific embodiment of the invention. It will be apparent, however, that variations and modifications can be made to the invention, with the attainment of some or all of the advantages of the invention. Therefore, it is the object of the appended claims to cover all such variations and modifications as come within the true spirit and scope of the invention.

What is claimed is:

1. A beverage filter cartridge comprising:

an impermeable hollow base, said base having a closed substantially flat circular bottom with a continuous truncated conical side wall extending upwardly therefrom to a radially outwardly protruding lip surrounding a circular access opening;

a self-supporting filter element received in said base, said filter element being permanently joined to an interior surface of said side wall at a location adjacent to said access opening and being configured and positioned to subdivide the interior of said base into first and second chambers, said first chamber being arranged to store a beverage extract received through said access opening; and

an impermeable circular cover closing said access opening and being permanently joined in a sealed relationship to said lip to cooperate with said base in forming an imperforate cartridge, said cover being yieldably pierceable to accommodate an injection of liquid into said first chamber for combination with said extract to produce a beverage, said filter being adapted to accommodate a flow therethrough of said beverage into said

5,840,189

5

second chamber, and said base being yieldably pierceable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

2. The beverage filter cartridge of claim 1 wherein said filter element is an inverted hollow cone having a curved wall tapering evenly from a circular rim surrounding an open upper end to a closed lower end, said circular rim being heat sealed to the interior surface of said wall.

3. The beverage filter cartridge of claim 2 wherein the closed lower end of said filter element is supported on and flattened by said bottom wall.

4. The beverage filter cartridge of claim 1 wherein said base is thermoformed from a laminate of a coextruded barrier sheet consisting of polystyrene, polyethylene, EVOH and adhesive.

5. The beverage filter cartridge of claim 1 wherein said cover is a laminate of nylon, aluminum and heatseal lacquer.

6. A beverage filter cartridge comprising:
an impermeable hollow base, said base having a circular closed bottom with a wall diverging upwardly therefrom to a radially outwardly protruding lip surrounding a circular access opening;

6

a filter element received in said base, said filter element being permanently joined to an interior surface of said wall at a location adjacent to said access opening and being configured and positioned to subdivide the interior of said base into first and second chambers, said first chamber being arranged to store a beverage extract received through said access opening; and

an imperforate circular cover closing said access opening and being permanently joined in a sealed relationship to said lip to cooperate with said base in completing the formation of said cartridge, said cover being yieldably pierceable to accommodate an injection of liquid into said first chamber for combination with said extract to produce a beverage, said filter being adapted to accommodate a flow therethrough of said beverage into said second chamber, and said base being yieldably pierceable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

* * * * *



US005325765A

United States Patent [19]

Sylvan et al.

[11] Patent Number: 5,325,765
[45] Date of Patent: Jul. 5, 1994

- [54] BEVERAGE FILTER CARTRIDGE
[75] Inventors: John E. Sylvan, Brookline; Peter B. Dragone, Concord, both of Mass.
[73] Assignee: Keurig, Inc., Waltham, Mass.
[21] Appl. No.: 945,746
[22] Filed: Sep. 16, 1992
[51] Int. Cl.⁵ A47J 31/24; A47J 31/14
[52] U.S. Cl. 99/295; 99/302 R;
99/317; 426/77; 426/433; 426/435
[58] Field of Search 426/77, 82, 473, 477,
426/479, 482, 435, 112, 433; 99/279, 295, 300,
302 R, 302 P, 304, 306, 307, 316, 317, 321

[56] References Cited

U.S. PATENT DOCUMENTS

- 240,402 4/1881 Gee .
346,278 7/1886 Halstead .
370,141 9/1887 Hobbs .
845,968 3/1907 Murray .
1,163,544 1/1916 Newlin .
1,302,483 4/1919 Vierling .
2,997,940 8/1961 Pecoraro et al. .
3,199,682 8/1965 Scholtz .
3,260,190 7/1966 Levinson 99/295
3,403,617 10/1968 Lampe 99/295
3,579,351 5/1971 Wege et al. 426/82
3,615,708 10/1971 Abile-Gal .

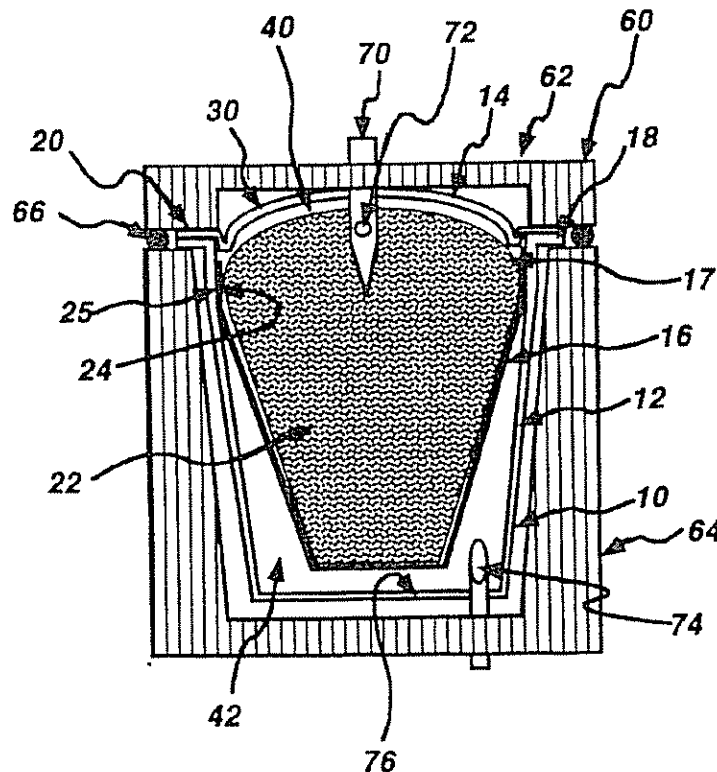
- 3,754,463 8/1973 Vernooy 99/302
3,971,305 7/1976 Daswick 426/77
4,204,966 5/1980 Morgan, Jr. .
4,321,139 3/1982 Auclair .
4,417,504 11/1983 Yamamoto .
4,584,101 4/1986 Kataoka 426/82
4,859,337 8/1989 Woltermann .
4,981,588 1/1991 Poulallion 426/77

Primary Examiner—Robert W. Jenkins
Attorney, Agent, or Firm—Samuels, Gauthier & Stevens

[57] ABSTRACT

A beverage filter cartridge includes an impermeable pierceable base having a predetermined shape and an opening at one end; a self-supporting wettable filter element disposed in the base sealingly engages with the opening in the base and has a form different and smaller than the predetermined shape of the base so that the filter element diverges from the base and divides the base into two sealed chambers, a first chamber for storing an extract of the beverage to be made, and a second empty chamber for accessing the beverage after the beverage outflow from the filter has been made by combining a liquid with the extract; and an impermeable pierceable cover sealingly engaged with the opening in the base to form an impermeable cartridge.

16 Claims, 4 Drawing Sheets



U.S. Patent

July 5, 1994

Sheet 1 of 4

5,325,765

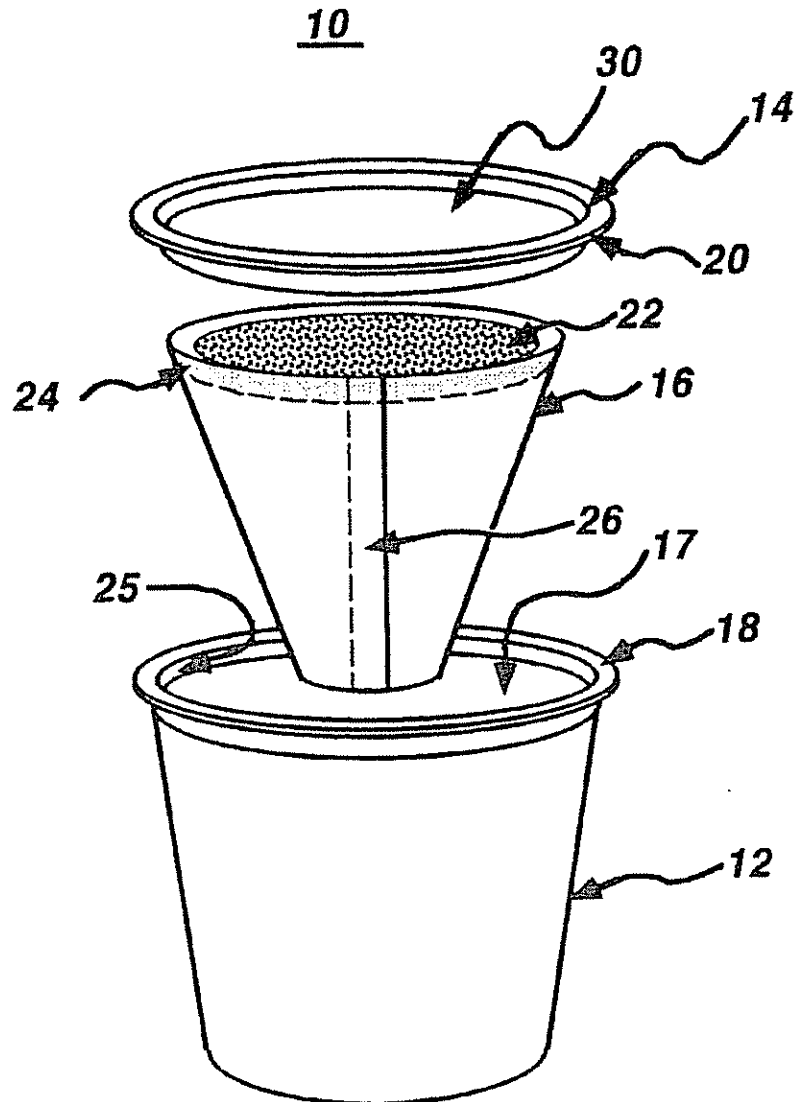


FIG. 1

U.S. Patent

July 5, 1994

Sheet 2 of 4

5,325,765

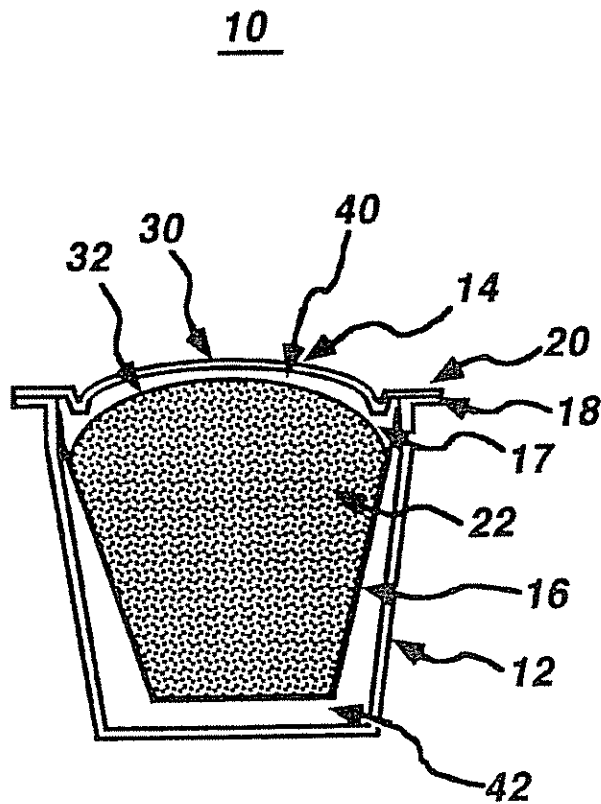


FIG. 2

U.S. Patent

July 5, 1994

Sheet 3 of 4

5,325,765

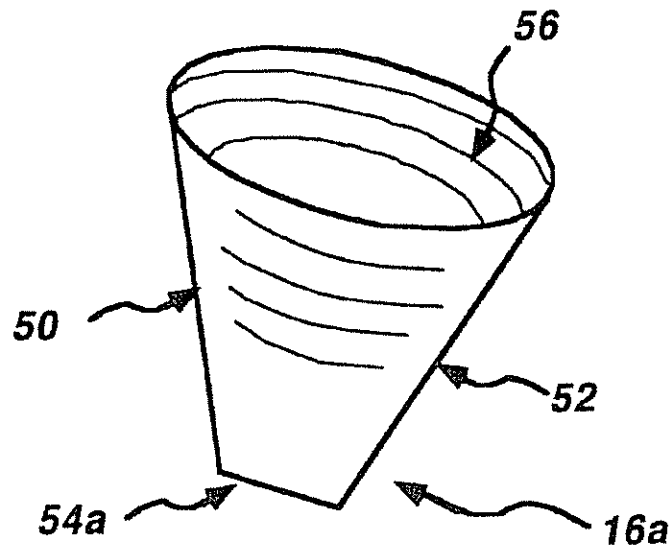


FIG. 3A

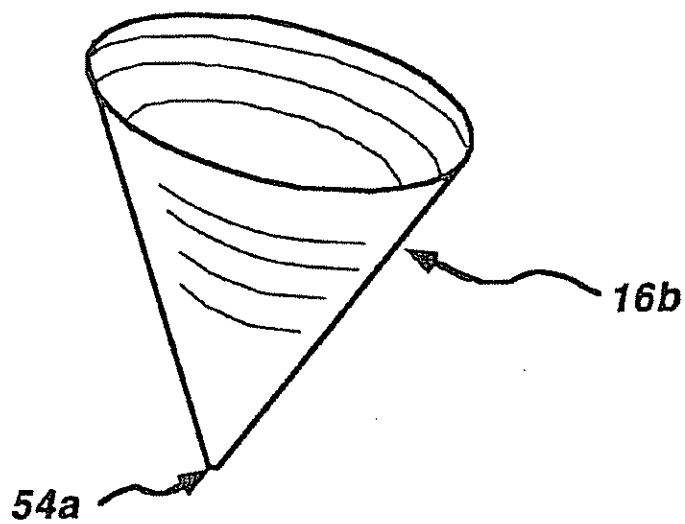


FIG. 3B

U.S. Patent

July 5, 1994

Sheet 4 of 4

5,325,765

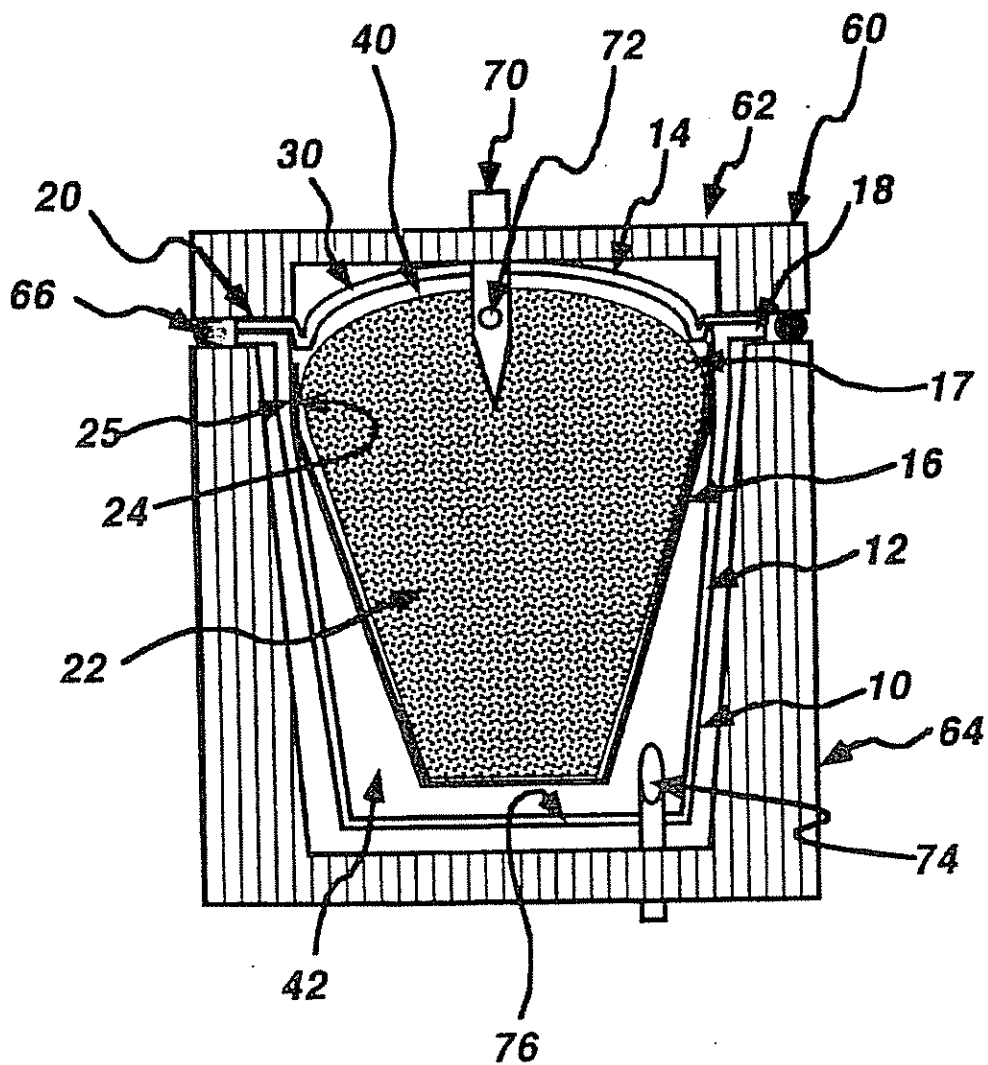


FIG. 4

1

BEVERAGE FILTER CARTRIDGE**FIELD OF INVENTION**

This invention relates to a beverage filter cartridge, and more particularly to such a beverage filter cartridge with a self-supporting wettable filter that provides an enlarged filter outflow chamber that enhances beverage flow and protects the filter against damage during penetration in an automatic brewing machine.

BACKGROUND OF INVENTION

There are a number of schemes for providing devices for making a single beverage server, such as a cup of coffee or tea. In one approach a disposable container fits on top of a cup and has a compartment for receiving a beverage extract such as coffee with a large reservoir on top into which a person must pour boiling water. These devices are disposable but expensive though, and the coffee is exposed to the air where it can easily get stale or contaminated. And they are not generally suitable for automatic coffee making or other beverage machines. Since the flow rate of beverage is generally slow, these devices are typically large relative to the volume of beverage dispensed. In addition, since these devices are designed to be used upright only the bottom area is available for filtration flow and this contributes to the slowness of the filtration process. Attempts to overcome these shortcomings have met with indifferent success. In one construction a filter is provided in a sealed receptacle but included intermediate the receptacle and filter is a support member which functions to support the filter. When the filter is wetted it sags and conforms with the support member which has a hole in it to release the filtered beverage but otherwise blocks the output of the filter. Such a filter design used in an application where water is injected under pressure would provide low flow rates.

SUMMARY OF INVENTION

It is therefore an object of this invention to provide an improved beverage filter cartridge.

It is a further object of this invention to provide such an improved beverage filter cartridge which is small and compact yet has a high flow rate.

It is a further object of this invention to provide such an improved beverage filter cartridge which is simple and has very few parts so it can be disposed of after a single use.

It is a further object of this invention to provide such an improved beverage filter cartridge whose filter is self supporting and does not collapse against the container even when wetted.

It is a further object of this invention to provide such an improved beverage filter cartridge which requires only a small filter element.

It is a further object of this invention to provide such an improved beverage filter cartridge which is not restricted in use to a single orientation.

It is a further object of this invention to provide such an improved beverage filter cartridge which is totally sealed for freshness and against contamination.

It is a further object of this invention to provide such an improved beverage filter cartridge which can be pierced for input and output flow without puncturing the filter.

It is a further object of this invention to provide such an improved beverage filter cartridge which maintains

5,325,765

2

its integrity and that of the filter even when the cartridge is dually penetrated for inflow and outflow.

It is a further object of this invention to provide such an improved beverage filter cartridge which even when the filter is wetted maintains a substantial volume between the filter and cartridge for safely receiving a penetrator and for enhancing filter flow-through.

This invention features a beverage filter cartridge including an impermeable pierceable base having a predetermined shape and an opening at one end. There is a self-supporting wettable filter element disposed in the base sealingly engaged with the opening of the base and having a form different and smaller than the predetermined shape of the base so that the filter element diverges from the base and divides the base into two sealed chambers. There is a first chamber for storing an extract of the beverage to be made and a second chamber for accessing the beverage outflow from the filter after the beverage has been made by combining a liquid with the extract. There is an impermeable pierceable cover sealingly engaged with the opening in the base to form a gas impermeable cartridge.

In a preferred embodiment the cover may be domed convexly outward. The opening of the base may include a flange and the cover may include a mating flange which establish the sealing engagement of the base and cover. The domed cover convexity may extend outwardly beyond the opening of the base. The filter and the base may both generally be truncated, non-congruent cones. The filter may be generally a cone shape and the base may be generally a truncated cone shape. The filter may be a triangular prism with a circular base and the base may be truncated cone shape. The base may be made of polystyrene, ethylene vinyl alcohol, and polyethylene. The cover may be made of the same material. The filter may be made of a lightweight, two-phase heat-sealable paper of cellulosic synthetic fibers. These synthetic fibers may be PVC or polypropylene. The filter element may terminate in a reduced apex portion spaced from the bottom of the base to define an enlarged second chamber for receiving the piercing element in the lower portion of the base without subjecting the filter element to penetration.

DISCLOSURE OF PREFERRED EMBODIMENT

Other objects, features and advantages will occur to those skilled in the art from the following description of a preferred embodiment and the accompanying drawings, in which:

FIG. 1 is a three-dimensional exploded view of a beverage filter cartridge according to this invention;

FIG. 2 is a side sectional elevational view of the cartridge of FIG. 1;

FIG. 3A is a three-dimensional view of the filter of FIGS. 1 and 2;

FIG. 3B is a view similar to FIG. 3A of an alternative conical shaped filter; and

FIG. 4 is a side elevational view similar to that shown in FIG. 2 of the cartridge installed in a portion of a machine which pierces both the top and the bottom chambers of the cartridge.

The beverage filter cartridge of this invention may be accomplished using an impermeable pierceable base having a predetermined shape such as a truncated cone with an opening at one end. The opening typically is round and has a rim or lip or flange at the opening, extending radially outwardly. The base may be made of

5,325,765

3

a combination of polystyrene, ethylene vinyl alcohol and polyethylene. There is a self-supporting wettable filter element disposed in the base and sealingly engaged with the lip or rim of the base. The filter element may be made of a lightweight, two-phase heat sealable paper of cellulosic and synthetic fibers. The synthetic fibers may be PVC or polypropylene so that they are compatible with the material of the base and are therefore easily sealed to the base using heat, ultrasonic energy or microwave energy. In addition, the material of the filter is such that the filter is totally self-supporting. Even when it is wetted, it will not collapse or sag against the inner walls of the base. The filter can have the shape of a cone, a truncated cone, or a triangular prism which fans out and blends into a circular base. The filter is smaller than and non-congruent with the base so that it diverges and divides the base into two sealed chambers. In the first chamber there is stored the extract of the beverage such as coffee that is to be made, and the second chamber has a substantial empty volume for accessing the beverage outflow from the filter after the beverage has been made by combining liquid with the extract. This enlarged volume of the second chamber enhances the filter flow since the filter is not in contact or in any way blocked by the walls of the base, and water can flow through the entire filter surface. In addition it provides ample room so that a penetrator which perforates the base will not injure or sacrifice the integrity of the filter itself. There is an impermeable pierceable cover which is sealingly engaged with the opening in the base to form a complete impermeable cartridge. The cover, which is made of the same material, also has a flange or rim or lip which extends radially outwardly and engages the mating rim on the base. The cover is typically domed convexly outwardly, so that for example when coffee is piled in the cartridge in the form of a typically rounded mound, the placement of the cover does not displace the coffee powder so that it leaks or sprays outwardly and degrades the quality of the seal along the flanges. In addition, the convex shape provides an increased rigidity for the cover so that it provides resistance to produce a clean penetration when a needle or other penetrator is inserted through it into the first chamber. It is through this penetration that the hot water is delivered to the coffee. The penetration in the base provides the exit for the liquid coffee to be dispensed.

There is shown in FIG. 1 a cartridge 10 according to this invention which includes base 12, cover 14, and filter 16. Base 12 includes opening 17 and outwardly facing flange rim or lip 18 similar to the rim 20 on cover 14. Base 12 has the shape of an inverted truncated cone, as does filter 16, which contains coffee powder 22.

Filter 16 can be drawn or formed as a monolithic structure or may be made in a pattern and then rolled and sealed such as at seam 26. Filter 16 is sealingly engaged at its edge 24 with the adjacent surface 25 of base 12. Cover 14 may have a domed portion 30, as seen more clearly in FIG. 2, which extends outwardly beyond opening 17 and rims 18 and 20. This domed shape 30 not only nicely accommodates the rounded top 32 of the coffee 22 in filter 16, but it also provides an extra measure of rigidity for cover 14 so that it can present a firm opposition resulting in a clean penetration from a needle or other penetrator in an automatic brewing machine or other type of machine. The seal formed between filter 16 and base 12 creates two chambers, chamber 40 in which coffee 22 is stored, and chamber

4

42 which receives the outflow from filter 16. Chamber 42 is produced by the fact that filter 16 is smaller and divergent, although often similar in shape to base 12. This larger chamber 42 enhances the outflow from filter 16 and also provides ample room for a penetrator to penetrate base 12 without puncturing filter 16. Although filter 16 is shown as a truncated conical structure, this is not a necessary limitation of the invention, as it might as well be what might be generally called a triangular prism, filter 16a, FIG. 3A, having sloping sides 50, 52, a reduced apex 54, and a generally circular base 56. In an alternative form, filter 16b, FIG. 3B, may take the form of a cone whose reduced apex 54b is simply the tip of the cone. In either case the apices 54, 54b would be spaced from the bottom of base 12.

Cartridge 10 is well adapted for use in an automatic machine such as a coffee brewing machine where it will be delivered to and gripped in a housing 60, FIG. 4, which has an upper part 62 and a lower part 64 sealingly engaged at seal 66 by a portion of the machine not shown. Part 62 includes a penetrator or needle 70 which penetrates domed cover 14 to provide pressurized hot water through hole 72 to coffee 22 in filter 16. A second penetrator or needle 74 is pushed through the bottom 76 of base 12 to receive the outflow of the coffee beverage and dispense it to a cup or container.

Although specific features of the invention are shown in some drawings and not others, this is for convenience only as some feature may be combined with any or all of the other features in accordance with the invention.

Other embodiments will occur to those skilled in the art and are within the following claims:

What is claimed is:

1. A beverage brewing apparatus comprising:

a housing having a first component defining a brewing chamber with an access opening, and a second component which may be opened to afford access to said brewing chamber via said access opening, and which may be closed to coact in sealing engagement with said first component to close said access opening;

an impermeable pierceable cartridge removably received in said brewing chamber via said access opening, said cartridge being internally subdivided by a filter element into first and second cartridge chambers;

a beverage extract contained in said first cartridge chamber;

liquid inlet and outlet means extending through said housing into said brewing chamber to penetrate through said cartridge into communication respectively with said first and second cartridge chambers; and

means for injecting liquid into said first cartridge chamber via said inlet means for combination with said beverage extract to produce a liquid beverage, said filter element being adapted to accommodate passage therethrough of said beverage into said second cartridge chamber for outflow through said outlet means.

2. The beverage brewing apparatus of claim 1 wherein said cartridge comprises a base having a predetermined shape and an open end, said filter element being disposed in said base, sealingly engaged with said open end and having a form different and smaller than said predetermined shape of said base so that said filter element diverges with respect to said base to divide said

5,325,765

5

base into first and second cartridge chambers; and a cover sealingly engaged with said open end.

3. The beverage brewing apparatus of claim 2 wherein said cover is domed convexly outwardly.

4. The beverage brewing apparatus of claim 2 wherein said base and cover include mating flanges coacting in sealing engagement to define an exterior rim surrounding said cartridge.

5. The beverage brewing apparatus of claim 4 wherein said rim is held between the first and second housing components when said second housing component is closed.

6. The beverage brewing apparatus of claim 2 wherein said inlet and said outlet means penetrate said cartridge when said second component is closed.

7. The beverage brewing apparatus of claim 2 wherein said filter element and said base are both generally truncated non-congruent cones.

8. The beverage brewing apparatus of claim 2 wherein said filter element is generally a cone shape and said base is generally a truncated cone shape.

9. The beverage brewing apparatus of claim 2 wherein said filter element is a triangular prism with a circular base and said base is a truncated cone shape.

6

10. The beverage brewing apparatus of claim 2 wherein said base is made of polystyrene, ethylene vinyl alcohol and polyethylene.

11. The beverage brewing apparatus of claim 2 wherein said cover is made of polystyrene, ethylene vinyl alcohol and polyethylene.

12. The beverage brewing apparatus of claim 2 wherein said filter element is made of lightweight two phase heat sealable paper of cellulosic and synthetic fibers.

13. The beverage brewing apparatus of claim 12 wherein said synthetic fibers are PVC or polypropylene.

14. The beverage brewing apparatus of claim 2 wherein filter element terminates in a reduced apex portion spaced from the bottom of said base to accommodate penetration of said outlet means into the lower portion of said base without subjecting said filter element to penetration.

15. The beverage brewing apparatus of claim 1 wherein said liquid inlet means protrudes through said second housing component, and said liquid outlet means protrudes through said first housing component.

16. The beverage brewing apparatus of claim 1 wherein said filter element is arranged within said cartridge to avoid penetration by said inlet and outlet means.

* * * * *

30

35

40

45

50

55

60

65

PART

2 of 3

WEBSTER'S NEW UNIVERSAL UNABRIDGED DICTIONARY

2,347 pages, thumb indexed

320,000 definitions

19 encyclopedic supplements

3,000 illustrations

Full-color maps of the world



DELUXE
SECOND EDITION

accismus

ac-cis-mus, *n.* [Gr. *akkismos*, coyness.] in rhetoric, a feigned refusal.
ac-cite', *v.t.* [L. *accitus*, pp. of *accire*; *ad*, to, and *cire*, to go, with causative force of *cieri*, cause to go.] to call; to cite; to summon. [Obs.]
ac-claim', *v.t.*; acclaimed, *pt.*, *pp.*; acclaiming, *ppr.* [L. *acclamare*; *ad*, to, and *clamare*, to cry out.]

1. to applaud.
2. to salute or declare by acclamation; as, to acclaim the President on his inauguration.
3. to cry aloud or shout; as, he acclaimed his grief.

ac-claim', *v.i.* to shout approval; as, the people acclaimed with one voice.

ac-claim', *n.* loud approval; acclamation.

ac-claim'er, *n.* one who acclaim.

ac-cla-ma'tion, *n.* [L. *acclamatio*, a shouting, from *ad*, and *clamare*, to cry out.]

1. loud applause; an eager expression of approval; a token of public approbation. Anciently, *acclamation* was a form of words, uttered with vehemence, somewhat resembling a song, sometimes accompanied with applause. In modern times, *acclamation* is expressed by hurrahs, by clapping of hands, and often by repeating words expressive of joy and good wishes.
2. in archaeology, a representation in sculpture or on medals, of people expressing joy. *Acclamation medals* are those on which laudatory acclamations are recorded.
3. spontaneous and unanimous action by a multitude or meeting in favor of a person or proposition; as, he was nominated, and the platform was adopted, by *acclamation*.

Syn.—applause, plaudits, acclaim, approval, cheer, exultation, shouting.

ac-clam'a-tō-ry, *a.* expressing joy or applause by acclamation.

ac-clim'a-ta-ble, *a.* capable of being acclimated.

ac-clim'a-tā'tion, *n.* same as *acclimatization*.

ac-clim'a-tē, *v.t.*; acclimated, *pt.*, *pp.*; acclimating, *ppr.* [Fr. *acclimater*, from L. *ad*, to, and *clima*, climate; Gr. *klima*(*l*), a belt or zone of the earth, from *klinein*, to slope or lean.] to accustom to a new climate or different environment.

ac-clim'a-ment, *n.* acclimation. [Rare.]

ac-clim'a-tion, *n.* 1. the process of becoming accustomed to a new climate.

2. the state of being habituated or accustomed to a climate.

ac-clim'a-ti-zā-ble, *a.* acclimatable.

ac-clim'a-ti-zā'tion, *n.* acclimation.

ac-clim'a-tize, *v.t.*; acclimatized, *pt.*, *pp.*; acclimatizing, *ppr.* to accustom to a new climate or different environment; acclimate.

ac-clim'a-tized, *a.* accustomed to a new climate.

ac-clim'a-tūre, *n.* the act of acclimating, or state of being acclimated. [Rare.]

ac-clināte, *a.* [L. *acclinatus*, pp. of *acclinare*; *ad*, to, and *clinare*, to lean.] bending upward.

ac-cliv'i-ty, *n.* [L. *acclivitas*, a slope, from *ad*, to, and the root *cliv*, to lean.] a slope or inclination of the earth, as the side of a hill, considered as ascending, in opposition to *declivity*, or a side descending; rising ground; ascent.

ac-cliv'ous, *a.* rising with a hill.

ac-cloy', *v.t.*; accloyed, *pt.*, *pp.*; accloying, *ppr.* [Fr. *encloyer*, to drive in a nail, from L. *in*, and *clavus*, nail.] to fill; to stuff; to fill to satiety. [Obs.]

ac-coast', *v.t.* and *v.i.* to lie or sail along the coast (of). [Obs.]

ac-coil', *v.t.*; accoiled, *pt.*, *pp.*; accoiling, *ppr.* [Fr. *accueillir*, from L. *ad*, to, and *colligere*, to collect.]

1. to collect; to gather together. [Obs.]

2. in nautical language, to coil up.

ac-co-lāde', *n.* [Fr. *accolade*, from L. *ad*, to, and *collum*, neck.]

1. a ceremony used in conferring knighthood, originally consisting of an embrace, or kiss, now done by touching the shoulder with the flat of a sword.

2. in music, a vertical line connecting several staves.

3. an approving or praising mention.

ac-co-lā-ted, *a.* bearing two or more profile heads, one overlapping another; as, an *accolated* coin.

ac-co-lent, *a.* [L. *accolere*, to dwell by, from L. *ad*, and *colere*, dwell.] dwelling in the same vicinity.

ac-co-lent, *n.* one who dwells near by; a neighbor.

ac-com-bl-nā'tion, *n.* combination. [Rare.]

ac-com-mō-dā-ble, *a.* [Fr. *accommodable*] that may be accommodated or fitted. [Rare.]

ac-com-mō-dā-ble-ness, *n.* the ability to be accommodated. [Rare.]

ac-com-mō-dāte, *v.t.*; accommodated, *pt.*, *pp.*; accommodating, *ppr.* [L. *accommodatus*, pp.; from *ad*, to, and *commodare*, to fit; *com*, and *modus*, a measure.]

1. to fit, adapt, or make suitable; as, to accommodate ourselves to circumstances; to accommodate the choice of subjects to the occasion.

2. to supply with or furnish; followed by *with*; as, to accommodate a man with apartments.

3. to supply with conveniences; as, to accommodate a friend.

4. to reconcile (things which are at variance); to adjust; as, to accommodate differences.

5. to show the fitness or agreement of; to apply; as, to accommodate prophecy to events.

6. to lend money to, or give commercial credit to.

Syn.—adapt, adjust, fit, suit, serve, oblige.

ac-com-mō-dāte, *v.i.* 1. to be in or come to adjustment, as the eye in order to see distinctly at a certain distance.

2. to conform. [Rare.]

ac-com-mō-dāte, *a.* suitable; fit; adapted; as, means accommodate to the end. [Obs.]

ac-com-mō-dāte-ly, *adv.* suitably; fitly. [Obs.]

ac-com-mō-dāte-ness, *n.* fitness. [Obs.]

ac-com-mō-dāt-ing, *a.* obliging; yielding to the desires of others; disposed to comply, and to oblige another; as, an accommodating man.

ac-com-mō-dā'tion, *n.* 1. fitness; adaptation; followed by *to*.

2. adjustment of differences; reconciliation, as of parties in dispute.

3. the provision of conveniences.

4. [pl.] conveniences; things furnished for use; chiefly applied to board, lodging, etc.; as, the accommodations at a hotel.

5. in mercantile language, a loan of money, or an extension of credit.

6. in theology, the application of a passage to something not originally intended by it, on the ground of resemblance or analogy.

Many of those quotations were probably intended as nothing more than accommodations.

7. automatic adjustment or the power of conforming, as that of the eye to see at different distances.

accommodation bill or note; a bill of exchange or a note made or endorsed without consideration by one or more persons to enable the drawer to get credit or raise money on it.

accommodation ladder; in nautical language, a ladder hung over the side of a ship at the gangway.

accommodation train; a railroad train that stops at all or most stations.

ac-com-mō-dā-tive, *a.* furnishing accommodation; accommodative.

ac-com-mō-dā-tive-ness, *n.* the state or quality of being accommodative.

ac-com-mō-dā-tōr, *n.* one who or that which accommodates.

ac-com-pā-nā-ble, *a.* sociable. [Obs.]

ac-com-pā-ni-er, *n.* one who or that which accompanies.

ac-com-pā-ni-ment, *n.* [Fr. *accompagnement*; L. *ad*, to, with, and *compania*, associate; from *com*, together, and *panis*, bread.]

1. that which attends as a circumstance, or which is added to the principal thing by way of ornament or for the sake of symmetry.

2. in music, the subordinate part or parts accompanying the voice or a principal instrument; also, the harmony of a figured bass.

ac-com-pā-nist, *n.* the performer in music who takes the accompanying part.

ac-com-pā-ny, *v.t.*; accompanied, *pt.*, *pp.*; accompanying, *ppr.* 1. to go with or attend as a companion or associate on a journey, walk, etc.; as, a man accompanied his friend to church, or on a tour.

2. to be with, as connected; to attend; as, pain accompanies disease.

3. in music, to act as an accompanist for.

Syn.—attend, escort.

ac-com-pā-ny, *v.i.* 1. to attend; to be an associate; as, to accompany with others. [Obs.]

2. to inhabit. [Obs.]

3. in music, to perform the accompanying part in a composition.

ac-com-plē-tive, *a.* tending to accomplish. [Rare.]

according

ac-com-plice, *n.* [L. *ad*, to, and *comple*, from *com*, together, and *plere*, to twist, also *pli*, care, to fold.] an associate in a crime; a partner or partaker in guilt. It was formerly used in a good sense for *co-operator*, but this sense is wholly obsolete. It is followed by *of* or *with* before a person; as, A was an accomplice of B in the murder of C. Sometimes used *with* before a thing, but it is generally used.

Syn.—accessory, abettor, ally.

ac-com-pli-ce-ship, *n.* the state of being an accomplice. [Rare.]

ac-com-pli-c'i-ty, *n.* complicity. [Rare.]

ac-com-plish, *v.t.*; accomplished, *pt.*, *pp.*; accomplishing, *ppr.* [Fr. *accomplir*, to finish from L. *ad*, and *comple*, to complete, to fill up.]

1. to do; to succeed in doing; to complete to finish entirely.

2. to execute; as, to accomplish a vow.

3. to gain; to obtain or effect by successful exertions; as, to accomplish a purpose.

4. to fulfill or bring to pass; as, to accomplish a prophecy.

5. to furnish thoroughly; to render accomplished.

Syn.—achieve, complete, effect, do, execute, finish, fulfill, perform, realize, bring about, carry out, consummate.

ac-com-plish-a-ble, *a.* capable of being accomplished.

ac-com-plished, *a.* 1. finished; completed; fulfilled; executed; effected.

2. well endowed with good qualities and manners; complete in acquirements; educated and polished.

Syn.—skilled, proficient, polished, refined, cultured, educated.

ac-com-plish-er, *n.* one who accomplishes.

ac-com-plish-ment, *n.* 1. completion; fulfillment; entire performance; as, the accomplishment of a prophecy.

2. the act of carrying into effect, or obtaining an object designed, attainment; as, the accomplishment of our desires or ends.

3. acquirement; that which constitutes excellence of mind, or elegance of manners, acquired by education or training; as, full of accomplishments.

accomplishment quotient (or *ratio*); achievement quotient.

ac-compt' (count'), *n.* account. [Archaic.]

ac-compt'ant, *n.* accountant. [Archaic.]

ac-cord', *n.* 1. agreement; harmony of minds; consent or concurrence of opinions or wills. They all continued with one accord in prayer.

2. harmony of sounds; agreement in pitch and tone; as, the accord of notes.

3. agreement; just correspondence of things; as, the accord of light and shade in painting.

4. will; voluntary or spontaneous motion; preceded by *own*.

Being more forward of his own accord. —2 Cor. viii. 17.

5. in law, an agreement between parties in controversy, by which satisfaction for an injury is stipulated, and which, when executed, bars a suit.

6. an informal agreement between countries.

ac-cord', *v.t.*; accorded, *pt.*, *pp.*; according, *ppr.* [OE. *acord*; Fr. *accorder*; from L. *ad*, to, and *cor*, cordis, heart.]

1. to make to agree or correspond; to adjust.

Her hands accorded the lute's music to the voice. —Sidney.

2. to bring to an agreement; to settle, adjust, or compose; as, to accord suits or controversies.

3. to grant; to give; to concede; as, to accord due praise.

ac-cord', *v.i.* 1. to agree; to be in correspondence; as, his dress accords with his duties.

2. to be in harmony.

ac-cord'a-ble, *a.* agreeing; suitable.

ac-cord'ance, *n.* 1. agreement with a person; conformity with a thing.

2. an agreeing.

3. a granting.

Syn.—agreement, concord, harmony.

ac-cord'an-cy, *n.* concordance.

ac-cord'ant, *a.* corresponding; consonant; agreeable.

ac-cord'ant-ly, *adv.* in an agreeable manner; suitably.

ac-cord'er, *n.* one who accords.

ac-cord'ing, *a.*—1. agreeing; harmonizing.

2. suitable; congruous; in accordance; used with *to*; as, according to the rules. [Obs.]

Oxford Dictionary of Current English

FOURTH EDITION

Edited by
Catherine Soanes
with Sara Hawker
and Julia Elliott

OXFORD
UNIVERSITY PRESS

OXFORD

UNIVERSITY PRESS

Great Clarendon Street, Oxford OX2 6DP

Oxford University Press is a department of the University of Oxford.

It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide in

Oxford New York

Auckland Cape Town Dar es Salaam Hong Kong Karachi

Kuala Lumpur Madrid Melbourne Mexico City Nairobi

New Delhi Shanghai Taipei Toronto

With offices in

Argentina Austria Brazil Chile Czech Republic France Greece

Guatemala Hungary Italy Japan Poland Portugal Singapore

South Korea Switzerland Thailand Turkey Ukraine Vietnam

Oxford is a registered trade mark of Oxford University Press
in the UK and in certain other countries

Published in the United States

by Oxford University Press Inc., New York

© Oxford University Press 1993, 1996, 1998, 2001, 2006

Database right Oxford University Press (makers)

First edition 1993

Revised (second edition) 1996

Revised (second edition) 1998

Third edition 2001

Fourth edition 2006

First published in 2005 as the *Pocket Oxford English Dictionary* (tenth edition)

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior permission in writing of Oxford University Press, or as expressly permitted by law, or under terms agreed with the appropriate reprographics rights organization. Enquiries concerning reproduction outside the scope of the above should be sent to the Rights Department, Oxford University Press, at the address above

You must not circulate this book in any other binding or cover
and you must impose this same condition on any acquirer

British Library Cataloguing in Publication Data

Data available

Library of Congress Cataloging in Publication Data

Data available

ISBN 0-19-861437-3 978-0-19-861437-1

ISBN 0-19-929996-X 978-0-19-929996-6 (USA edition)

Typeset in Frutiger and Parable

by Interactive Sciences Ltd, Gloucester

Printed in Great Britain by

Clays Ltd, Bungay, Suffolk

acclamation | accrue

– ORIGIN Latin *acclamare*.

acclamation • n. loud and enthusiastic approval or praise.

acclimatize (or *acclimatise*)

• v. (*acclimatizes, acclimatizing, acclimatized*) adapt to a new climate or new conditions.

– DERIVATIVES *acclimatization* n.

– ORIGIN French *acclimater*.

accolade /ak-kuh-layd/ • n. something given as a special honour or as a reward for excellence.

– ORIGIN first meaning 'a touch on a person's shoulders with a sword when knighting them': from Provençal *acolada* 'embrace around the neck'.

accommodate • v. (*accommodates, accommodating, accommodated*)
1 provide lodging or space for. 2 adapt to or fit in with: *they tried to accommodate the children's needs*.

– ORIGIN Latin *accommodare*.

☒ Remember that **accommodate** and the related word **accommodation** are spelled with a double c and a double m.

accommodating • adj. willing to help or fit in with someone's wishes.

accommodation • n. 1 a place where someone may live or stay. 2 a settlement or compromise.

accompaniment • n. 1 a musical part which accompanies an instrument, voice, or group. 2 something that adds to or improves something else.

accompanist • n. a person who plays a musical accompaniment.

accompany • v. (*accompanies, accompanying, accompanied*) 1 go somewhere with someone. 2 be present or occur at the same time as something else. 3 play musical support or backing for an instrument, voice, or group.

– ORIGIN Old French *accompagner*.

accomplice /uh-kum-pliss/ • n. a person who helps another to commit a crime.

– ORIGIN Old French *complice*.

accomplish • v. achieve or complete something successfully.

– ORIGIN Old French *acomplir*.

accomplished • adj. highly skilled.

accomplishment • n. 1 something that has been achieved successfully. 2 a skill or special ability. 3 the successful achievement of a task.

accord • v. 1 give power or recognition to someone. 2 (*accord with*) be in agreement or consistent with something.

• n. 1 agreement in opinion. 2 an official agreement or treaty.

– PHRASES *of your own accord* willingly.

– ORIGIN Old French *acorder* 'reconcile, be of one mind'.

accordance • n. (in phr. *in accordance with*) in a way that agrees or conforms with.

according • adv. (*according to*) 1 as stated by. 2 following or agreeing with: *cook the rice according to the instructions*.

accordingly • adv. 1 in a way that is appropriate. 2 therefore.

accordion /uh-kor-di-uhn/ • n. a musical instrument played by stretching and squeezing with the hands to work a bellows, the notes being sounded by buttons or keys.

– DERIVATIVES *accordionist* n.

– ORIGIN German *Akkordion*.

accost • v. approach and speak to someone boldly or aggressively.

– ORIGIN French *accoster*.

account • n. 1 a description of an event. 2 a record of money spent and received. 3 a service through a bank or company by which funds are held on behalf of a customer or goods or services are supplied on credit. 4 importance: *money was of no account to her*. • v. regard in a particular way.

– PHRASES *account for* 1 supply or make up an amount. 2 give a satisfactory explanation of. *call someone to account* ask someone to explain poor performance. *on someone's account* for someone's benefit. *on account of* because of. *on no account* under no circumstances. *take account of* take into consideration.

– ORIGIN Old French *acont*.

accountable • adj. responsible for your actions and expected to explain them.

– DERIVATIVES *accountability* n.

accountant • n. a person who keeps or inspects financial accounts.

– DERIVATIVES *accountancy* n.

accounting • n. the keeping of financial accounts.

accoutrement /uh-koo-truh-muhnt, uh-koo-ter-muhnt/ (US *accouterment*)

• n. an extra item of clothing or equipment.

– ORIGIN French *accoutrer* 'clothe, equip'.

accredit • v. (*accredits, accrediting, accredited*) 1 (*accredit something to*) give someone the credit for something. 2 give official authorization to.

– DERIVATIVES *accreditation* n.

– ORIGIN French *accréditer*.

accretion /uh-kree-sh'n/ • n. 1 growth or increase by a gradual build-up of layers. 2 a thing formed or added in this way.

– ORIGIN Latin *accrescere* 'grow'.

accrue /uh-kroo/ • v. (*accrues, accruing, accrued*) 1 (of money) be received in regular or increasing amounts. 2 collect or receive payments or benefits.

– DERIVATIVES *accrual* n.

Webster's
Third
New International
Dictionary
OF THE ENGLISH LANGUAGE
UNABRIDGED

Merriam-Webster
REG. U.S. PAT. OFF.

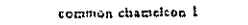
*Utilizing all the experience and resources of more than
one hundred years of Merriam-Webster® dictionaries*

EDITOR IN CHIEF
PHILIP BABCOCK GOVE, Ph.D.
AND
THE MERRIAM-WEBSTER
EDITORIAL STAFF



MERRIAM-WEBSTER INC., *Publishers*
SPRINGFIELD, MASSACHUSETTS, U.S.A.

champney rose

[illegible][illegible][illegible]

picuculo

[illegible]

1712

[illegible]

pierceable

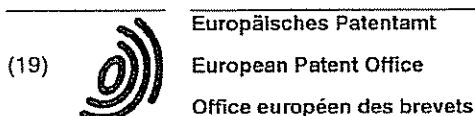
[illegible]

abolition

[illegible][illegible][illegible]

perceable

[illegible]



(11) **EP 1 440 913 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
07.06.2006 Bulletin 2006/23

(51) Int Cl.:
B65D 81/00 ^(2006.01) **A47J 31/40** ^(2006.01)

(21) Application number: 04250384.7

(22) Date of filing: 23.01.2004

(54) **Cartridge for the preparation of beverages**

Patrone zur Zubereitung von Getränken

Cartouche pour la préparation de boissons

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR

(30) Priority: 24.01.2003 GB 0301710

(43) Date of publication of application:
28.07.2004 Bulletin 2004/31

(73) Proprietor: Kraft Foods R&D, Inc.
81737 Munich (DE)

(72) Inventors:
• Halliday, Andrew,
c/o Kraft Foods (UK) Limited
Oxfordshire OX16 7QU (GB)

• Carter, Steven
London N8 7DN (GB)
• Haegermarck, Jan Anders
142 63 Trangsund (SE)

(74) Representative: Thomson, Neil David et al
Boult Wade Tennant
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT (GB)

(56) References cited:
EP-A- 0 272 922 EP-A- 0 334 571
EP-A- 0 451 980 WO-A-01/58786

EP 1 440 913 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 440 913 B1

Description

[0001] The present invention relates to a cartridge for the preparation of beverages and, in particular, to sealed cartridges which are formed from substantially air- and water-impermeable materials and which contain one or more ingredients for the preparation of beverages.

[0002] It has previously been proposed to seal beverage preparation ingredients in individual air-impermeable packages. For example, cartridges or capsules containing compacted ground coffee are known for use in certain coffee preparation machines which are generally termed "espresso" machines. In the production of coffee using these preparation machines the coffee cartridge is placed in a brewing chamber and hot water is passed through the cartridge at relatively high pressures, thereby extracting the aromatic coffee constituents from the ground coffee to produce the coffee beverage. Typically, such machines operate at a pressure of greater than 6×10^5 Pa. The preparation machines of the type described have to date been relatively expensive since components of the machine, such as the water pumps and seals, must be able to withstand the high pressures.

[0003] EP0272922 and EP451980 described beverage cartridges accordingly to the preamble of claim 1.

[0004] In WO01/58786 there is described a cartridge for the preparation of beverages which operates at a pressure generally in the range 0.7 to 2.0×10^5 Pa. However, the cartridge is designed for use in a beverage preparation machine for the commercial or industrial market and is relatively expensive. Hence, there remains a requirement for a cartridge for the preparation of beverages wherein the cartridges and beverage preparation machine are suitable, in particular, for the domestic market in terms of cost, performance and reliability.

[0005] In typical known beverage cartridges the inlet and outlet of the beverage cartridges are formed on opposite sides of the cartridge. This has the disadvantage that the beverage preparation machine used to dispense the cartridges normally requires a complicated mechanical arrangement for moving inlet and outlet piercers into engagement with the cartridge from opposite directions. In addition, the inlet and outlet piercers can also impede access for inserting and withdrawing the beverage cartridge from the beverage preparation machine. In WO01/60220 a beverage cartridge is provided wherein the inlet and outlet are formed on the same side of the cartridge. However, this cartridge can be prone to blockage of the inlet piercers since they contact directly the beverage ingredients.

[0006] Accordingly, the present invention provides a cartridge containing one or more beverage ingredients and being formed from substantially air- and water-impermeable materials, the cartridge defining a storage chamber containing the one or more beverage ingredients and a manifold chamber, the cartridge comprising an opening through which the one or more beverage ingredients can be filled into the storage chamber, the opening being closed by a lid having a first portion overlying the manifold chamber and a second portion overlying the storage chamber, characterised in that the first portion of the lid is pierceable in use to accommodate an inflow of an aqueous medium into the manifold chamber and the lid is pierceable in use to accommodate an outflow of beverage formed from interaction of the aqueous medium and the one or more beverage ingredients in the storage chamber.

[0007] It will be understood that by the term "cartridge" as used herein is meant any package, container, sachet or receptacle which contains one or more beverage ingredients in the manner described. The cartridge may be rigid, semi-rigid or flexible.

[0008] The cartridge of the present invention contains one or more beverage ingredients suitable for the formation of a beverage product. The beverage product may be, for example, one of coffee, tea, chocolate or a dairy-based beverage including milk. The beverage ingredients may be powdered, ground, leaf-based or liquid. The beverage ingredients may be insoluble or soluble. Examples include roast and ground coffee, leaf tea, powdered chocolate and soup, liquid milk-based beverages and concentrated fruit juices.

[0009] The cartridge of the present invention is advantageous in that the inflow and outflow of beverage from the cartridge is from the same side, that is through the lid. This allows for a simpler construction of the inlet and outlet piercers of a beverage preparation machine to be used with the cartridge since both piercers may be provided on a common plane. In addition, the overall height of the beverage preparation machine may be reduced since it is not necessary to provide piercing means and their associated flow pipes both above and below the cartridge. Access to insert and withdraw the cartridge from the beverage preparation machine is also improved since fewer components need to be positioned above the cartridge. Also advantageously, the cartridge of the present invention provides a manifold chamber into which the aqueous medium, such as water, is introduced in use. The manifold chamber is separated from the storage chamber which contains the beverage ingredients. Thus soiling of the inlet piercer of the beverage preparation machine is prevented since the inlet piercer does not directly contact the beverage ingredients. Further, the manifold chamber improves the circulation of the water within the cartridge and improves the evenness of the flow of the water into and through the storage chamber. This leads to an increased consistency in yield from the beverage cartridges.

[0010] Preferably, the cartridge further comprises a discharge chamber which is overlain by a third portion of the lid which is pierceable in use to accommodate the outflow of beverage formed from interaction of the aqueous medium and the one or more beverage ingredients in the storage chamber.

[0011] Preferably, the discharge chamber comprises a discharge spout.

EP 1 440 913 B1

[0012] Preferably, the manifold chamber and the storage chamber are divided by a partition comprising one or more apertures. The apertures are sized to prevent passage of the one or more beverage ingredients from the storage chamber into the manifold chamber. Since the beverage ingredients cannot pass through the apertures the manifold chamber is kept free of beverage ingredients.

5 [0013] Preferably the manifold chamber at least partially surrounds the storage chamber. In one embodiment, the manifold chamber substantially encircles the storage chamber. Typically the manifold chamber substantially encircles the storage chamber and the apertures are provided along substantially all of an interface between the manifold chamber and the storage chamber.

10 [0014] Preferably the apertures have a width of between 0.25 and 0.35 mm and a length of between 1.4 and 1.8 mm. Typically between 20 and 40 apertures are provided.

[0015] Preferably, the manifold chamber comprises an inlet portion into which the aqueous medium is introduced, wherein the inlet portion communicates with the remainder of the manifold chamber via one or more openings. Preferably, the inlet portion is circular.

15 [0016] Preferably, the storage chamber and the discharge chamber are divided by an inner member. The inner member may comprise one or more apertures. In one embodiment, the inner member comprises a filter to prevent passage of the one or more beverage ingredients from the storage chamber into the discharge chamber while accommodating passage of the beverage therethrough.

20 [0017] Advantageously, the lid is joined to the outer member and the inner member. Typically, the lid is joined to the outer member around a periphery of the cartridge and the lid is joined to the inner member at or near a centre of the cartridge. The lid may be joined to a discharge funnel of the inner member.

[0018] Preferably, the outer member has a greater rigidity than the lid.

[0019] Preferably, the location of piercing of the lid to accommodate the inflow and outflow is such that aqueous medium passing through the cartridge moves generally inwardly from the inlet to the outlet.

25 [0020] Also preferably, the cartridge is shaped such that the aqueous medium passes through the storage chamber in a generally upwards direction.

[0021] The present invention also provides a plurality of cartridges, each cartridge as above, wherein the percentage yield of the beverage produced from the one or more beverage ingredients contained in the cartridges is consistent to within a standard deviation of 1%.

30 [0022] The present invention also provides a method of use of a cartridge as described above wherein the cartridge is displaced relative to one or more static piercing elements in order to form the inlet to, and outlet from, the cartridge. This is advantageous in that a simplified piercing mechanism may be utilised which is not required to be articulated or otherwise moved. In addition, since the piercing elements are static a more precise alignment of the cartridge and the piercing elements may be achieved resulting in improved performance and less splashing of the aqueous medium, particularly at the outflow.

35 [0023] In the following description the terms "upper" and "lower" and equivalents will be used to describe the relational positioning of features of the invention. The terms "upper" and "lower" and equivalents should be understood to refer to the cartridge (or other components) in its normal orientation for insertion into a beverage preparation machine and subsequent dispensing as shown, for example, in Figure 4. In particular, "upper" and "lower" refer, respectively, to relative positions nearer or further from a top surface 11 of the cartridge. In addition, the terms "inner" and "outer" and equivalents will be used to describe the relational positioning of features of the invention. The terms "inner" and "outer" and equivalents should be understood to refer to relative positions in the cartridge (or other components) being, respectively, nearer or further from a centre or major axis X of the cartridge 1 (or other component).

40 [0024] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

45 Figure 1 is cross-sectional drawing of an outer member of first and second embodiments of cartridge according to the present invention;

Figure 2 is a cross-sectional drawing of a detail of the outer member of Figure 1 showing an inwardly directed cylindrical extension;

50 Figure 3 is a cross-sectional drawing of a detail of the outer member of Figure 1 showing a slot;

Figure 4 is a perspective view from above of the outer member of Figure 1;

Figure 5 is a perspective view from above of the outer member of Figure 1 in an inverted orientation;

Figure 6 is a plan view from above of the outer member of Figure 1;

Figure 7 is a cross-sectional drawing of an inner member of the first embodiment of cartridge;

55 Figure 8 is a perspective view from above of the inner member of Figure 7;

Figure 9 is a perspective view from above of the inner member of Figure 7 in an inverted orientation;

Figure 10 is a plan view from above of the inner member of Figure 7;

Figure 11 is a cross-sectional drawing of the first embodiment of cartridge in an assembled condition;

EP 1 440 913 B1

Figure 12 is a cross-sectional drawing of an inner member of the second embodiment of cartridge;
 Figure 13 is a cross-sectional drawing of a detail of the inner member of Figure 12 showing an aperture;
 Figure 14 is a perspective view from above of the inner member of Figure 12;
 Figure 15 is a perspective view from above of the inner member of Figure 12 in an inverted orientation;
 5 Figure 16 is another cross-sectional drawing of the inner member of Figure 12;
 Figure 17 is a cross-sectional drawing of another detail of the inner member of Figure 12 showing an air inlet;
 Figure 18 is a cross-sectional drawing of the second embodiment of cartridge in an assembled condition;
 Figure 19 is cross-sectional drawing of an outer member of third and fourth embodiments of cartridge according to the present invention;
 10 Figure 20 is a cross-sectional drawing of a detail of the outer member of Figure 19 showing an inwardly directed cylindrical extension;
 Figure 21 is a plan view from above of the outer member of Figure 19;
 Figure 22 is a perspective view from above of the outer member of Figure 19;
 Figure 23 is a perspective view from above of the outer member of Figure 19 in an inverted orientation;
 15 Figure 24 is a cross-sectional drawing of an inner member of the third embodiment of cartridge;
 Figure 25 is a plan view from above of the inner member of Figure 24;
 Figure 26 is a cross-sectional drawing of a detail of the inner member of Figure 24 showing an in-turned upper rim;
 Figure 27 is a perspective view from above of the inner member of Figure 24;
 Figure 28 is a perspective view from above of the inner member of Figure 24 in an inverted orientation;
 20 Figure 29 is a cross-sectional drawing of the third embodiment of cartridge in an assembled condition;
 Figure 30 is a cross-sectional drawing of an inner member of the fourth embodiment of cartridge;
 Figure 31 is a plan view from above of the inner member of Figure 30;
 Figure 32 is a perspective view from above of the inner member of Figure 30;
 Figure 33 is a perspective view from above of the inner member of Figure 30 in an inverted orientation;
 25 Figure 34 is a cross-sectional drawing of the fourth embodiment of cartridge in an assembled condition;
 Figure 35 is a front perspective view of a beverage preparation machine according to the present invention;
 Figure 36 is a front perspective view of the machine of Figure 35 with a cartridge head in an open position;
 Figure 37 is a rear perspective view of the machine of Figure 35 with some parts omitted for clarity;
 Figure 38 is another rear perspective view of the machine of Figure 35 with some parts omitted for clarity;
 30 Figure 39 is a perspective view of the cartridge head of the machine of Figure 35 with some parts omitted for clarity;
 Figure 40 is another perspective view of the cartridge head of the machine of Figure 35 with some parts omitted for clarity;
 Figure 41 is a cross-sectional view of the cartridge head in a closed position;
 Figure 42 is a cross-sectional view of the cartridge head in an open position;
 35 Figure 43 is a schematic layout of the machine of Figure 35;
 Figure 44a and 44b are schematic layouts of first and second code recognition means for the machine of Figure 35; and
 Figure 45 is a plan view of a beverage of the present invention comprising a barcode.

40 **[0025]** As shown in Figure 11, the cartridge 1 of the present invention generally comprises an outer member 2, an inner member 3 and a laminate 5. The outer member 2, inner member 3 and laminate 5 are assembled to form the cartridge 1 which has an interior 120 for containing one or more beverage ingredients, an inlet 121, an outlet 122 and a beverage flow path linking the inlet 121 to the outlet 122 and which passes through the interior 120. The inlet 121 and outlet 122 are initially sealed by the laminate 5 and are opened in use by piercing or cutting of the laminate 5. The
 45 beverage flow path is defined by spatial inter-relationships between the outer member 2, inner member 3 and laminate 5 as discussed below. Other components may optionally be included in the cartridge 1, such as a filter 4, as will be described further below.

[0026] A first version of cartridge 1 which will be described for background purposes is shown in Figures 1 to 11. The first version of the cartridge 1 is particularly designed for use in dispensing filtered products such as roast and ground coffee or leaf tea. However, this version of the cartridge 1 and the other versions described below may be used with
 50 other products such as chocolate, coffee, tea, sweeteners, cordials, flavourings, alcoholic beverages, flavoured milk, fruit juices, squashes, sauces and desserts.

[0027] As can be seen from Figure 5, the overall shape of the cartridge 1 is generally circular or disc-shaped with the diameter of the cartridge 1 being significantly greater than its height. A major axis X passes through the centre of the
 55 outer member as shown in Figure 1. Typically the overall diameter of the outer member 2 is 74.5 mm \pm 6mm and the overall height is 16 mm \pm 3mm. Typically the volume of the cartridge 1 when assembled is 30.2 ml \pm 20%.

[0028] The outer member 2 generally comprises a bowl-shaped shell 10 having a curved annular wall 13, a closed top 11 and an open bottom 12. The diameter of the outer member 2 is smaller at the top 11 compared to the diameter

EP 1 440 913 B1

at the bottom 12, resulting from a flaring of the annular wall 13 as one traverses from the closed top 11 to the open bottom 12. The annular wall 13 and closed bottom 11 together define a receptacle having an interior 34.

[0029] A hollow inwardly directed cylindrical extension 18 is provided in the closed top 11 centred on the major axis X. As more clearly shown in Figure 2, the cylindrical extension 18 comprises a stepped profile having first, second and third portions 19, 20 and 21. The first portion 19 is right circular cylindrical. The second portion 20 is frusto-conical in shape and is inwardly tapered. The third portion 21 is another right circular cylinder and is closed off by a lower face 31. The diameter of the first, second and third portion 19, 20 and 21 incrementally decreases such that the diameter of the cylindrical extension 18 decreases as one traverses from the top 11 to the closed lower face 31 of the cylindrical extension 18. A generally horizontal shoulder 32 is formed on the cylindrical extension 18 at the junction between the second and third portions 20 and 21.

[0030] An outwardly extending shoulder 33 is formed in the outer member 2 towards the bottom 12. The outwardly extending shoulder 33 forms a secondary wall 15 co-axial with the annular wall 13 so as to define an annular track forming a manifold 16 between the secondary wall 15 and the annular wall 13. The manifold 16 passes around the circumference of the outer member 2. A series of slots 17 are provided in the annular wall 13 level with the manifold 16 to provide gas and liquid communication between the manifold 16 and the interior 34 of the outer member 2. As shown in Figure 3, the slots 17 comprise vertical slits in the annular wall 13. Between 20 and 40 slots are provided. In the embodiment shown thirty-seven slots 17 are provided generally equi-spaced around the circumference of the manifold 16. The slots 17 are preferably between 1.4 and 1.8 mm in length. Typically the length of each slot is 1.6 mm representing 10% of the overall height of the outer member 2. The width of each slot is between 0.25 and 0.35 mm. Typically, the width of each slot is 0.3 mm. The width of the slots 17 is sufficiently narrow to prevent the beverage ingredients passing therethrough into the manifold 16 either during storage or in use.

[0031] An inlet chamber 26 is formed in the outer member 2 at the periphery of the outer member 2. A cylindrical wall 27 is provided, as most clearly shown in Figure 5, which defines the inlet chamber 26 within, and partitions the inlet chamber 26 from the interior 34 of the outer member 2. The cylindrical wall 27 has a closed upper face 28 which is formed on a plane perpendicular to the major axis X and an open lower end 29 co-planar with the bottom 12 of the outer member 2. The inlet chamber 26 communicates with the manifold 16 via two slots 30 as shown in Figure 1. Alternatively, between one and four slots may be used to communicate between the manifold 16 and the inlet chamber 26.

[0032] A lower end of the outwardly extending shoulder 33 is provided with an outwardly extending flange 35 which extends perpendicularly to the major axis X. Typically the flange 35 has a width of between 2 and 4 mm. A portion of the flange 35 is enlarged to form a handle 24 by which the outer member 2 may be held. The handle 24 is provided with an upturned rim 25 to improve grip.

[0033] The outer member 2 is formed as a single integral piece from high density polyethylene, polypropylene, polystyrene, polyester, or a laminate of two or more of these materials. A suitable polypropylene is the range of polymers available from DSM UK Limited (Redditch, United Kingdom). The outer member may be opaque, transparent or translucent. The manufacturing process may be injection moulding.

[0034] The inner member 3 as shown in Figures 7 to 10, comprises an annular frame 41 and a downwardly extending cylindrical funnel 40. A major axis X passes through the centre of the inner member 3 as shown in Figure 7.

[0035] As best shown in Figure 8, the annular frame 41 comprises an outer rim 51 and an inner hub 52 joined by ten equi-spaced radial spokes 53. The inner hub 52 is integral with and extends from the cylindrical funnel 40. Filtration apertures 55 are formed in the annular frame 41 between the radial spokes 53. A filter 4 is disposed on the annular frame 41 so as to cover the filtration apertures 55. The filter is preferably made from a material with a high wet strength, for example a non-woven fibre material of polyester. Other materials which may be used include a water-impermeable cellulosic material, such as a cellulosic material comprising woven paper fibres. The woven paper fibres may be admixed with fibres of polypropylene, polyvinyl chloride and/or polyethylene. The incorporation of these plastic materials into the cellulosic material renders the cellulosic material heat-sealable. The filter 4 may also be treated or coated with a material which is activated by heat and/or pressure so that it can be sealed to the annular frame 41 in this way.

[0036] As shown in the cross-sectional profile of Figure 7, the inner hub 52 is located at a lower position than the outer rim 51, resulting in the annular frame 41 having a sloping lower profile.

[0037] The upper surface of each spoke 53 is provided with an upstanding web 54 which divides a void space above the annular frame 41 into a plurality of passages 57. Each passage 57 is bounded on either side by a web 54 and on a lower face by the filter 4. The passages 57 extend from the outer rim 51 downwardly towards, and open into, the cylindrical funnel 40 at openings 56 defined by the inner extremities of the webs 54.

[0038] The cylindrical funnel 40 comprises an outer tube 42 surrounding an inner discharge spout 43. The outer tube 42 forms the exterior of the cylindrical funnel 40. The discharge spout 43 is joined to the outer tube 42 at an upper end of the discharge spout 43 by means of an annular flange 47. The discharge spout 43 comprises an inlet 45 at an upper end which communicates with the openings 56 of the passages 57 and an outlet 44 at a lower end through which the prepared beverage is discharged into a cup or other receptacle. The discharge spout 43 comprises a frusto-conical portion 48 at an upper end and a cylindrical portion 58 at a lower end. The cylindrical portion 58 may have a slight taper

EP 1 440 913 B1

such that it narrows towards the outlet 44. The frusto-conical portion 48 helps to channel beverage from the passages 57 down towards the outlet 44 without inducing turbulence to the beverage. An upper surface of the frusto-conical portion 48 is provided with four support webs 49 equi-spaced around the circumference of the cylindrical funnel 40. The support webs 49 define channels 50 therebetween. The upper edges of the support webs 49 are level with one another and perpendicular to the major axis X.

[0039] The inner member 3 may be formed as a single integral piece from polypropylene or a similar material as described above and by injection moulding in the same manner as the outer member 2.

[0040] Alternatively, the inner member 3 and/or the outer member 2 may be made from a biodegradable polymer. Examples of suitable materials include degradable polyethylene (for example, SPITEK supplied by Symphony Environmental, Borehamwood, United Kingdom), biodegradable polyesteramide (for example, BAK 1095 supplied by Symphony Environmental), poly lactic acids (PLA supplied by Cargil, Minnesota, USA), starch-based polymers, cellulose derivatives and polypeptides.

[0041] The laminate 5 is formed from two layers, a first layer of aluminium and a second layer of cast polypropylene. The aluminium layer is between 0.02 and 0.07 mm in thickness. The cast polypropylene layer is between 0.025 and 0.065 mm in thickness. In one embodiment the aluminium layer is 0.06 mm and the polypropylene layer is 0.025 mm thick. This laminate is particularly advantageous as it has a high resistance to curling during assembly. As a result the laminate 5 may be pre-cut to the correct size and shape and subsequently transferred to the assembly station on the production line without undergoing distortion. Consequently, the laminate 5 is particularly well suited to welding. Other laminate materials may be used including PET/Aluminium/PP, PE/EVOH/PP, PET/metallised/PP and Aluminium/PP laminates. Roll laminate stock may be used instead of die cut stock.

[0042] The cartridge 1 may be closed by a rigid or semi-rigid lid instead of a flexible laminate.

[0043] Assembly of the cartridge 1 involves the following steps:

- a) the inner member 3 is inserted into the outer member 2;
- b) the filter 4 is cut to shape and placed onto the inner member 3 so to be received over the cylindrical funnel 40 and come to rest against the annular frame 41;
- c) the inner member 3, outer member 2 and filter 4 are joined by ultrasonic welding;
- d) the cartridge 1 is filled with one or more beverage ingredients;
- e) the laminate 5 is affixed to the outer member 2.

[0044] These steps will be discussed in greater detail below.

[0045] The outer member 2 is oriented with the open bottom 12 directed upwards. The inner member 3 is then inserted into the outer member 2 with the outer rim 51 being received as a loose fit in an axial extension 14 at top 11 of the cartridge 1. The cylindrical extension 18 of the outer member 2 is at the same time received in the upper portion of the cylindrical funnel 40 of the inner member 3. The third portion 21 of the cylindrical extension 18 is seated inside the cylindrical funnel 40 with the closed lower face 31 of the cylindrical extension 18 bearing against the support webs 49 of the inner member 3. The filter 4 is then placed over the inner member 3 such that the filter material contacts the annular rim 51. An ultrasonic welding process is then used to join the filter 4 to the inner member 3 and at the same time, and in the same process step, the inner member 3 to the outer member 2. The inner member 3 and filter 4 are welded around the outer rim 51. The inner member 3 and outer member 2 are joined by means of weld lines around the outer rim 51 and also the upper edges of the webs 54.

[0046] As shown most clearly in Figure 11, the outer member 2 and inner member 3 when joined together define a void space 130 in the interior 120 below the annular flange 41 and exterior the cylindrical funnel 40 which forms a filtration chamber. The filtration chamber 130 and passages 57 above the annular frame 41 are separated by the filter paper 4.

[0047] The filtration chamber 130 contains the one or more beverage ingredients 200. The one or more beverage ingredients are packed into the filtration chamber 130. For a filtered style beverage the ingredient is typically roast and ground coffee or leaf tea. The density of packing of the beverage ingredients in the filtration chamber 130 can be varied as desired. Typically, for a filtered coffee product the filtration chamber contains between 5.0 and 10.2 grams of roast and ground coffee in a filtration bed of thickness of typically 5 to 14 mm. Optionally, the interior 120 may contain one or more bodies, such as spheres, which are freely movable within the interior 120 to aid mixing by inducing turbulence and breaking down deposits of beverage ingredients during discharge of the beverage.

[0048] The laminate 5 is then affixed to the outer member 2 by forming a weld 126 around the periphery of the laminate 5 to join the laminate 5 to the lower surface of the outwardly extending flange 35. The weld 126 is extended to seal the laminate 5 against the lower edge of the cylindrical wall 27 of the inlet chamber 26. Further, a weld 125 is formed between the laminate 5 and the lower edge of the outer tube 42 of the cylindrical funnel 40. The laminate 5 forms the lower wall of the filtration chamber 130 and also seals the inlet chamber 26 and cylindrical funnel 40. However, a small gap 123 exists prior to dispensation between the laminate 5 and the lower edge of the discharge spout 43. A variety of welding methods may be used, such as heat and ultrasonic welding, depending on the material characteristics of the laminate 5.

EP 1 440 913 B1

[0049] Advantageously, the inner member 3 spans between the outer member 2 and the laminate 5. The inner member 3 is formed from a material of relative rigidity, such as polypropylene. As such, the inner member 3 forms a load-bearing member that acts to keep the laminate 5 and outer member 2 spaced apart when the cartridge 1 is compressed. It is preferred that the cartridge 1 is subjected to a compressive load of between 130 and 280N in use. The compressive force acts to prevent the cartridge failing under internal pressurisation and also serves to squeeze the inner member 3 and outer member 2 together. This ensures that the internal dimensions of passageways and apertures in the cartridge 1 are fixed and unable to change during pressurisation of the cartridge 1.

[0050] To use the cartridge 1 it is first inserted into a beverage preparation machine and the inlet 121 and outlet 122 are opened by piercing members of the beverage preparation machine which perforate and fold back the laminate 5. An aqueous medium, typically water, under pressure enters the cartridge 1 through the inlet 121 into the inlet chamber 26 at a pressure of between 0.1-2.0 bar. From there the water is directed to flow through the slots 30 and round the manifold 16 and into the filtration chamber 130 of the cartridge 1 through the plurality of slots 17. The water is forced radially inwardly through the filtration chamber 130 and mixes with the beverage ingredients 200 contained therein. The water is at the same time forced upwardly through the beverage ingredients. The beverage formed by passage of the water through the beverage ingredients passes through the filter 4 and filtration apertures 55 into the passages 57 lying above the annular frame 41. The sealing of the filter 4 onto the spokes 53 and the welding of the rim 51 with the outer member 2 ensures that there are no short-circuits and all the beverage has to pass through the filter 4.

[0051] The beverage then flows downwardly along the radial passages 57 formed between the webs 54 and through the openings 56 and into the cylindrical funnel 40. The beverage passes along the channels 50 between the support webs 47 and down the discharge spout 43 to the outlet 44 where the beverage is discharged into a receptacle such as a cup.

[0052] Preferably, the beverage preparation machine comprises an air purge facility, wherein compressed air is forced through the cartridge 1 at the end of the dispense cycle to flush out the remaining beverage into the receptacle.

[0053] A second version of cartridge 1 is shown in Figures 12 to 18. The second version of the cartridge 1 is particularly designed for use in dispensing espresso-style products such as roast and ground coffee where it is desirable to produce a beverage having a froth of tiny bubbles known as a crema. Many of the features of the second version of the cartridge 1 are the same as in the first version and like numerals have been used to reference like features. In the following description the differences between the first and second versions will be discussed. Common features which function in the same manner will not be discussed in detail.

[0054] The outer member 2 is of the same construction as in the first version of cartridge 1 and as shown in Figures 1 to 6.

[0055] The annular frame 41 of the inner member 3 is the same as in the first version. Also, a filter 4 is disposed on the annular frame 41 so as to cover the filtration apertures 55. The outer tube 42 of the cylindrical funnel 40 is also as before. However, there are a number of differences in the construction of the inner member 2 of the second version compared to the first version. As shown in Figure 16, the discharge spout 43 is provided with a partition 65 which extends part way up the discharge spout 43 from the outlet 44. The partition 65 helps to prevent the beverage spraying and/or splashing as it exits the discharge spout 43. The profile of the discharge spout 43 is also different and comprises a stepped profile with a distinct dog-leg 66 near an upper end of the tube 43.

[0056] A rim 67 is provided upstanding from the annular flange 47 joining the outer tube 42 to the discharge spout 43. The rim 67 surrounds the inlet 45 to the discharge spout 43 and defines an annular channel 69 between the rim 67 and the upper portion of the outer tube 42. The rim 67 is provided with an inwardly directed shoulder 68. At one point around the circumference of the rim 67 an aperture 70 is provided in the form of a slot which extends from an upper edge of rim 67 to a point marginally below the level of the shoulder 68 as most clearly shown in Figures 12 and 13. The slot has a width of 0.64 mm.

[0057] An air inlet 71 is provided in annular flange 47 circumferentially aligned with the aperture 70 as shown in Figures 16 and 17. The air inlet 71 comprises an aperture passing through the flange 47 so as to provide communication between a point above the flange 47 and the void space below the flange 47 between the outer tube 42 and discharge spout 43. Preferably, and as shown, the air inlet 71 comprises an upper frusto-conical portion 73 and a lower cylindrical portion 72. The air inlet 71 is typically formed by a mould tool such as a pin. The tapered profile of the air inlet 71 allows the mould tool to be more easily removed from the moulded component. The wall of the outer tube 42 in the vicinity of the air inlet 71 is shaped to form a chute 75 leading from the air inlet 71 to the inlet 45 of the discharge spout 43. As shown in Figure 17, a canted shoulder 74 is formed between the air inlet 71 and the chute 75 to ensure that the jet of beverage issuing from the slot 70 does not immediately foul on the upper surface of the flange 47 in the immediate vicinity of the air inlet 71.

[0058] The assembly procedure for the second version of cartridge 1 is similar to the assembly of the first version. However, there are certain differences. As shown in Figure 18, the third portion 21 of the cylindrical extension 18 is seated inside the support rim 67 rather than against support webs. The shoulder 32 of the cylindrical extension 18 between the second portion 20 and third portion 21 bears against the upper edge of the support rim 67 of the inner member 3. An interface zone 124 is thus formed between the inner member 3 and the outer member 2 comprising a

EP 1 440 913 B1

face seal between the cylindrical extension 18 and the support rim 67 which extends around nearly the whole circumference of the cartridge 1. The seal between the cylindrical extension 18 and the support rim 67 is not fluid-tight though since the slot 70 in the support rim 67 extends through the support rim 67 and downwardly to a point marginally below the shoulder 68. Consequently the interface fit between the cylindrical extension 18 and the support rim 67 transforms the slot 70 into an aperture 128, as most clearly shown in Figure 18, providing gas and liquid communication between the annular channel 69 and the discharge spout 43. The aperture is typically 0.64 mm wide by 0.69 mm long.

[0059] Operation of the second version of cartridge 1 to dispense a beverage is similar to the operation of the first version but with certain differences. Beverage in the radial passages 57 flows downwardly along the passages 57 formed between the webs 54 and through the openings 56 and into the annular channel 69 of the cylindrical funnel 40. From the annular channel 69 the beverage is forced under pressure through the aperture 128 by the back pressure of beverage collecting in the filtration chamber 130 and passages 57. The beverage is thus forced through aperture 128 as a jet and into an expansion chamber formed by the upper end of the discharge spout 43. As shown in Figure 18, the jet of beverage passes directly over the air inlet 71. As the beverage enters the discharge spout 43 the pressure of the beverage jet drops. As a result air is entrained into the beverage stream in the form of a multitude of small air bubbles as the air is drawn up through the air inlet 71. The jet of beverage issuing from the aperture 128 is funnelled downwards to the outlet 44 where the beverage is discharged into a receptacle such as a cup where the air bubbles form the desired crema. Thus, the aperture 128 and the air inlet 71 together form an eductor which acts to entrain air into the beverage. Flow of beverage into the eductor should be kept as smooth as possible to reduce pressure losses. Advantageously, the walls of the eductor should be made concave to reduce losses due to 'wall effect' friction. The dimensional tolerance of the aperture 128 is small. Preferably the aperture size is fixed plus or minus 0.02 mm². Hairs, fibrils or other surface irregularities can be provided within or at the exit of the eductor to increase the effective cross-sectional area which has been found to increase the degree of air entrainment.

[0060] A third version of cartridge 1 is shown in Figures 19 to 29. The third version of the cartridge 1 is particularly designed for use in dispensing soluble products which may be in powdered, liquid, syrup, gel or similar form. The soluble product is dissolved by or forms a suspension in, an aqueous medium such as water when the aqueous medium is passed, in use, through the cartridge 1. Examples of beverages include chocolate, coffee, milk, tea, soup or other rehydratable or aqueous-soluble products. Many of the features of the third version of the cartridge 1 are the same as in the previous versions and like numerals have been used to reference like features. In the following description the differences between the third and previous versions will be discussed. Common features which function in the same manner will not be discussed in detail.

[0061] Compared to the outer member 2 of the previous versions, the hollow inwardly directed cylindrical extension 18 of the outer member 2 of the third version has a larger overall diameter as shown in Figure 20. In particular the diameter of the first portion 19 is typically between 16 and 18 mm compared to 13.2 mm for the outer member 2 of the previous versions. In addition, the first portion 19 is provided with a convex outer surface 19a, or bulge, as most clearly shown in Figure 20, the function of which will be described below. The diameter of the third portions 21 of the cartridges 1 are however the same resulting in the area of the shoulder 32 being greater in this, the third version of the cartridge 1. Typically the volume of the cartridge 1 when assembled is 32.5 ml \pm 20%.

[0062] The number and positioning of the slots in the lower end of the annular wall 13 is also different. Between 3 and 5 slots are provided. In the embodiment as shown in Figure 23, four slots 36 are provided equi-spaced around the circumference of the manifold 16. The slots 36 are slightly wider than in the previous versions of the cartridge 1 being between 0.35 and 0.45 mm, preferably 0.4 mm wide.

[0063] In other respects the outer members 2 of the cartridges 1 are the same.

[0064] The construction of the cylindrical funnel 40 of the inner member 3 is the same as in the first version of cartridge 1 with an outer tube 42, discharge spout 45, annular flange 47 and support webs 49 being provided. The only difference is that the discharge spout 45 is shaped with an upper frusto-conical section 92 and a lower cylindrical section 93.

[0065] In contrast to the previous versions and as shown in Figures 24 to 28, the annular frame 41 is replaced by a skirt portion 80 which surrounds the cylindrical funnel 40 and is joined thereto by means of eight radial struts 87 which adjoin the cylindrical funnel 40 at or near the annular flange 47. A cylindrical extension 81 of the skirt portion 80 extends upwardly from the struts 87 to define a chamber 90 with an open upper face. An upper rim 91 of the cylindrical extension 81 has an in-turned profile as shown in Figure 26. An annular wall 82 of the skirt portion 80 extends downwardly from the struts 87 to define an annular channel 86 between the skirt portion 80 and the outer tube 42.

[0066] The annular wall 82 comprises at a lower end an exterior flange 83 which lies perpendicular to the major axis X. A rim 84 depends downwardly from a lower surface of the flange 83 and contains five apertures 85 which are circumferentially equi-spaced around the rim 84. Thus, the rim 84 is provided with a castellated lower profile.

[0067] Apertures 89 are provided between the struts 87 allowing communication between the chamber 90 and the annular channel 86.

[0068] The assembly procedure for the third version of cartridge 1 is similar to the assembly of the first version but with certain differences. The outer member 2 and inner member 3 are push-fitted together as shown in Figure 29 and

EP 1 440 913 B1

retained by means of a snap-fit arrangement rather than welded together. On joining the two members the inwardly directed cylindrical extension 18 is received inside the upper cylindrical extension 81 of the skirt portion 80. The inner member 3 is retained in the outer member 2 by frictional interengagement of the convex outer surface 19a of the first portion 19 of the cylindrical extension 18 with the in-turned rim 91 of the upper cylindrical extension 81. With the inner member 3 located in the outer member 2 a mixing chamber 134 is defined located exterior to the skirt portion 80. The mixing chamber 134 contains the beverage ingredients 200 prior to dispensation. It should be noted that the four inlets 36 and the five apertures 85 are staggered circumferentially with respect to one another. The radial location of the two parts relative to each other need not be determined or fixed during assembly since the use of four inlets 36 and five apertures 85 ensures that misalignment occurs between the inlets and apertures whatever the relative rotational positioning of the components.

[0069] The one or more beverage ingredients are packed into the mixing chamber 134 of the cartridge. The density of packing of the beverage ingredients in the mixing chamber 134 can be varied as desired.

[0070] The laminate 5 is then affixed to the outer member 2 and inner member 3 in the same manner as described above in the previous versions.

[0071] In use, water enters the mixing chamber 134 through the four slots 36 in the same manner as previous versions of the cartridge. The water is forced radially inwardly through the mixing chamber and mixes with the beverage ingredients contained therein. The product is dissolved or mixed in the water and forms the beverage in the mixing chamber 134 and is then driven through the apertures 85 into the annular channel 86 by back pressure of beverage and water in the mixing chamber 134. The circumferential staggering of the four inlet slots 36 and the five apertures 85 ensures that jets of water are not able to pass radially directly from the inlet slots 36 to the apertures 85 without first circulating within the mixing chamber 134. In this way the degree and consistency of dissolution or mixing of the product is significantly increased. The beverage is forced upwardly in the annular channel 86, through the apertures 89 between the struts 87 and into the chamber 90. The beverage passes from chamber 90 through the inlets 45 between the support webs 49 into the discharge spout 43 and towards the outlet 44 where the beverage is discharged into a receptacle such as a cup. The cartridge finds particular application with beverage ingredients in the form of viscous liquids or gels. In one application a liquid chocolate ingredient is contained in the cartridge 1 with a viscosity of between 1700 and 3900mPa at ambient temperature and between 5000 and 10000mPa at 0°C and a refractive solids of 67 Brix \pm 3. In another application liquid coffee is contained in the cartridge 1 with a viscosity of between 70 and 2000mPa at ambient and between 80 and 5000mPa at 0°C where the coffee has a total solids level of between 40 and 70%.

[0072] A fourth version of cartridge 1 is shown in Figures 30 to 34. The fourth version of the cartridge 1 is particularly designed for use in dispensing liquid products such as concentrated liquid milk. Many of the features of the fourth version of the cartridge 1 are the same as in the previous versions and like numerals have been used to reference like features. In the following description the differences between the fourth and previous versions will be discussed. Common features which function in the same manner will not be discussed in detail.

[0073] The outer member 2 is the same as in the third version of cartridge 1 and as shown in Figures 19 to 23.

[0074] The cylindrical funnel 40 of the inner member 3 is similar to that shown in the second version of cartridge 1 but with certain differences. As shown in Figure 30 the discharge spout 43 is shaped with an upper frusto-conical section 106 and a lower cylindrical section 107. Three axial ribs 105 are provided on the inner surface of the discharge spout 43 to direct the dispensed beverage downwards towards the outlet 44 and prevent the discharged beverage from spinning within the spout. Consequently, the ribs 105 act as baffles. As in the second version of cartridge 1, an air inlet 71 is provided through the annular flange 47. However, the chute 75 beneath the air inlet 71 is more elongated than in the second version.

[0075] A skirt portion 80 is provided similar to that shown in the third version of the cartridge 1 described above. Between 5 and 12 apertures 85 are provided in the rim 84. Typically ten apertures are provided rather than the five provided in the third version of cartridge 1.

[0076] An annular bowl 100 is provided extending from and integral with the flange 83 of the skirt portion 80. The annular bowl 100 comprises a flared body 101 with an open upper mouth 104 which is directed upwards. Four feed apertures 103 shown in Figures 30 and 31 are located in the body 101 at or near the lower end of the bowl 100 where it joins the skirt portion 80. Preferably, the feed apertures are equi-spaced around the circumference of the bowl 100.

[0077] The laminate 5 is of the type described above in the previous embodiments.

[0078] The assembly procedure for the fourth version of cartridge 1 is the same as that for the third version.

[0079] Operation of the fourth version of cartridge is similar to that of the third version. The water enters the cartridge 1 and the mixing chamber 134 in the same manner as before. There the water mixes with and dilutes the liquid product which is then forced out through the apertures 85 towards the outlet 44 as described above. A proportion of the liquid product is initially contained within the annular bowl 100 as shown in Figure 34 and is not subject to immediate dilution by the water entering the mixing chamber 134. The diluted liquid product in the lower part of the mixing chamber 134 will tend to exit through apertures 85 rather than be forced up and into the annular bowl 100 through upper mouth 104. Consequently, the liquid product in the annular bowl 100 will remain relatively concentrated compared to the product in

EP 1 440 913 B1

the lower part of the mixing chamber 134. The liquid product in the annular bowl 100 drips through the feed apertures 103 into the stream of product exiting the mixing chamber 134 through the apertures 85. The annular bowl 100 acts to even out the concentration of the diluted liquid product entering the cylindrical funnel 40 by holding back a proportion of the concentrated liquid product and releasing it into the exiting liquid stream more steadily throughout the dispensation cycle.

[0080] From the annular channel 86 the beverage is forced under pressure through the aperture 128 by the back pressure of beverage collecting in the filtration chamber 134 and chamber 90. The beverage is thus forced through aperture 128 as a jet and into an expansion chamber formed by the upper end of the discharge spout 43. As shown in Figure 34, the jet of beverage passes directly over the air inlet 71. As the beverage enters the discharge spout 43 the pressure of the beverage jet drops. As a result air is entrained into the beverage stream in the form of a multitude of small air bubbles as the air is drawn up through the air inlet 71. The jet of beverage issuing from the aperture 128 is funnelled downwards to the outlet 44 where the beverage is discharged into a receptacle such as a cup where the air bubbles form the desired frothy appearance.

[0081] Advantageously, the inner member 3, outer member 2, laminate 5 and filter 4 can all be readily sterilised due to the components being separable and not individually comprising tortuous passageways or narrow crevices. Rather, it is only after conjoining the components, after sterilisation, that the necessary passageways are formed. This is particularly important where the beverage ingredient is a dairy-based product such as liquid milk concentrate.

[0082] The fourth embodiment of beverage cartridge is particularly advantageous for dispensing a concentrated dairy-based liquid product such as liquid milk. Previously, powdered milk products have been provided in the form of sachets for adding to a pre-prepared beverage. However, for a cappuccino-style beverage it is necessary to foam the milk. This has been achieved previously by passing steam through a liquid milk product. However this necessitates the provision of a steam supply which increases the cost and complexity of the machine used to dispense the beverage. The use of steam also increases the risk of injury during operation of the cartridge. Accordingly the present invention provides for a beverage cartridge having a concentrated dairy-based liquid product therein. It has been found that by concentrating the milk product a greater amount of foam can be produced for a particular volume of milk when compared to fresh or UHT milk. This reduces the size required for the milk cartridge. Fresh semi-skimmed milk contains approximately 1.6% fat and 10% total solids. The concentrated liquid milk preparations of the present invention contain between 3 and 10% fat and 25 to 40% total solids. In a typical example, the preparation contains 4% fat and 30% total solids. The concentrated milk preparations are suitable for foaming using a low pressure preparation machine as will be described below. In particular, foaming of the milk is achieved at pressures below 2 bar, preferably approximately 1.5 bar using the cartridge of the fourth embodiment described above.

[0083] The cartridge of the fourth embodiment is also advantageous in dispensing liquid coffee products.

[0084] It has been found that the embodiments of beverage cartridge of the present invention advantageously provide an improved consistency of the dispensed beverage when compared to prior art cartridges. Reference is made to Table 1 below which shows the results of brew yields for twenty samples each of cartridges A and B containing roast and ground coffee. Cartridge A is a beverage cartridge according to the first embodiment of the present invention. Cartridge B is a prior art beverage cartridge as described in the applicant's document WO01/58786. The refractive index of the brewed beverage is measured in Brix units and converted to a percentage of soluble solids (%SS) using standard tables and formulae. In the examples below:

$$\%SS = 0.7774 * (\text{Brix value}) + 0.0569.$$

$$\% \text{ Yield} = (\%SS * \text{Brew Volume (g)}) / (100 * \text{Coffee Weight (g)})$$

Table 1

CARTRIDGE A					
Sample	Brew Volume (g)	Coffee Weight (g)	Brix	% SS (*)	% Yield
1	105.6	6.5	1.58	1.29	20.88
2	104.24	6.5	1.64	1.33	21.36

EP 1 440 913 B1

Table continued

CARTRIDGE A					
Sample	Brew Volume (g)	Coffee Weight (g)	Brix	% SS (*)	% Yield
3	100.95	6.5	1.67	1.36	21.05
4	102.23	6.5	1.71	1.39	21.80
5	100.49	6.5	1.73	1.40	21.67
6	107.54	6.5	1.59	1.29	21.39
7	102.70	6.5	1.67	1.36	21.41
8	97.77	6.5	1.86	1.50	22.61
9	97.82	6.5	1.7	1.38	20.75
10	97.83	6.5	1.67	1.36	20.40
11	97.6	6.5	1.78	1.44	21.63
12	106.64	6.5	1.61	1.31	21.47
13	99.26	6.5	1.54	1.25	19.15
14	97.29	6.5	1.59	1.29	19.35
15	101.54	6.5	1.51	1.23	19.23
16	104.23	6.5	1.61	1.31	20.98
17	97.5	6.5	1.73	1.40	21.03
18	100.83	6.5	1.68	1.36	21.14
19	101.67	6.5	1.67	1.36	21.20
20	101.32	6.5	1.68	1.36	21.24
				AVERAGE	20.99
CARTRIDGE B					
Sample	Brew Volume (g)	Coffee Weight (g)	Brix	% SS (*)	% Yield
1	100.65	6.5	1.87	1.511	23.39
2	95.85	6.5	1.86	1.503	22.16
3	98.4	6.5	1.8	1.456	22.04
4	92.43	6.5	2.3	1.845	26.23
5	100.26	6.5	1.72	1.394	21.50
6	98.05	6.5	2.05	1.651	24.90
7	99.49	6.5	1.96	1.581	24.19
8	95.62	6.5	2.3	1.845	27.14
9	94.28	6.5	2.17	1.744	25.29
10	98.13	6.5	1.72	1.394	20.62
11	96.86	6.5	1.81	1.464	21.82
12	94.03	6.5	2.2	1.767	25.56
13	96.28	6.5	1.78	1.441	21.34
14	95.85	6.5	1.95	1.573	23.19
15	95.36	6.5	1.88	1.518	22.28

EP 1 440 913 B1

Table continued

CARTRIDGE B					
16	92.73	6.5	1.89	1.526	21.77
17	88	6.5	1.59	1.293	17.50
18	93.5	6.5	2.08	1.674	24.08
19	100.88	6.5	1.75	1.417	22.00
20	84.77	6.5	2.37	1.899	24.77
				AVERAGE	23.09

[0085] Performing a t-test statistical analysis on the above data gives the following results:

Table 2 t-Test: Two-Sample Assuming Equal Variances

	% Yield (Cartridge A)	% Yield (Cartridge B)
Mean	20.99	23.09
Variance	0.77	5.04
Observations	20	20
Pooled Variance	2.90	
Hypothesized Mean Difference	0	
df	38	
t Stat	-3.90	
P(T<=t) one-tail	0.000188	
t Critical one-tail	1.686	
P(T<=t) two-tail	0.000376	
t Critical two-tail	2.0244	
Standard Deviation	0.876	2.245

[0086] The analysis shows that the consistency of % yield, which equates to brew strength, for the cartridges of the present invention is significantly better (at a 95% confidence level) than the prior art cartridges, with a standard deviation of 0.88% compared to 2.24%. This means that beverages dispensed with the cartridges of the present invention have a more repeatable and uniform strength. This is preferred by consumers who like their drinks to taste the same time after time and do not want arbitrary changes in drink strength.

[0087] The materials of the cartridges described above may be provided with a barrier coating to improve their resistance to oxygen and/or moisture and/or other contaminant ingress. The barrier coating may also improve the resistance to leakage of the beverage ingredients from within the cartridges and/or reduce the degree of leaching of extractibles from the cartridge materials which might adversely affect the beverage ingredients. The barrier coating may be of a material selected from the group of PET, Polyamide, EVOH, PVDC or a metallised material. The barrier coating may be applied by a number of mechanisms including but not limited to vapour deposition, vacuum deposition, plasma coating, co-extrusion, in-mould labelling and two/multi-stage moulding.

[0088] A beverage preparation machine 201 according to the present invention for use with the above described beverage cartridges is shown in Figures 35 to 45. The beverage preparation machine 201 generally comprises a housing 210 containing a water tank 220, a water heater 225, a water pump 230, an air compressor 235, a control processor, a user interface 240 and a cartridge head 250. The cartridge head 250 in turn generally comprises a cartridge holder 251 for holding, in use, the beverage cartridge 1, cartridge recognition means 252 and inlet and outlet piercers 253, 254 for forming, in use, the inlet 121 and the outlet 122 in the beverage cartridge 1.

[0089] The housing 210 contains and holds in position the other components of the machine 201. The housing 210 preferably made in whole or in part from a robust plastics material such as ABS. Alternatively, the housing 210 can be made in whole or in part from a metallic material such as stainless steel or aluminium. The housing 210 is preferably comprises a clam-shell design having a front half 211 and a rear half 212 which allow access during assembly for fitting of the machine 201 components and can afterwards be joined together to define an interior 213 of the housing 210. The rear half 212 provides a recess 214 for the attachment of the water tank 220. The housing 210 is formed with means,

EP 1 440 913 B1

such as detents, abutments, bosses and threaded portions, for retaining the components of the machine 201 in position without the need for a separate chassis. This reduces the overall cost and weight of the machine 201. A base 215 of the housing 210 is preferably provided with feet for standing the machine thereon in a stable manner. Alternatively, the base 215 itself may have a shape forming a stable support.

5 [0090] The front half 211 of the housing 210 comprises a dispense station 270 where dispensation of the beverage takes place. The dispense station 270 comprises a receptacle stand 271 having a hollow interior forming a drip tray 272. An upper surface 273 of the receptacle stand is provided with a grill 274 on which the receptacle is positioned. The drip tray 272 is removable from the housing 210 to ease emptying of the collected water. A recess 275 is formed in the front half of the housing 210 above the receptacle stand 271 to accommodate the dimensions of the receptacle.

10 [0091] The cartridge head 250 is located towards the top of the housing 210 above the receptacle stand as shown in Figures 35 and 36. Preferably, the height of the grill 274 relative to the cartridge head 250 can be adjusted to accommodate different sizes of receptacle. It is preferred that the receptacle is as close to the cartridge head 250 as possible, whilst still allowing the receptacle to be inserted and withdrawn from the dispense station 270, so as to minimise the height that the dispensed beverage has to descend before contacting the receptacle. This acts to minimise spraying and splashing of the beverage and minimise loss of entrained air bubbles where these are present. Preferably receptacles of between 70mm and 110 mm in height can be inserted between the grill 274 and cartridge head 250.

15 [0092] The machine user interface 240 is located on the front of the housing 210 and comprises a start/stop button 241, and a plurality of status indicators 243-246.

20 [0093] The status indicators 243-246 preferably include a light emitting diode (LED) 243 to indicate readiness of the machine 201, a LED 244 to indicate if an error has occurred in the machine 201 operation, and one or more LEDs 245-256 to indicate whether the machine 201 is operating in manual or automatic modes. The LEDs 243-246 may be controlled to illuminate at a constant intensity, to flash intermittently, or both depending on the status of the machine 201. The LEDs 243-246 may have a variety of colours including green, red and yellow.

25 [0094] The start/stop button 241 controls commencement of the dispense cycle and is a manually operated push-button, switch or similar.

30 [0095] A volume adjustment control may be provided to allow a user of the machine 201 to manually adjust the volume of the delivered beverage without altering the other operating characteristics. Preferably the volume adjustment control allows an adjustment in volume of plus or minus 20%. The volume adjustment control may be a rotary knob, a linear slider, a digital readout with increment and decrement buttons, or similar. More typically, volume is controlled by a user operating the start/stop button 241.

[0096] A manual power switch (not shown) may be provided on the machine 201. Alternatively, power supply can be controlled simply by insertion or removal of the power supply plug from the mains power supply.

35 [0097] The water tank 220 is located to the rear of the housing 210 and is connected to the rear half 212 of the housing 210. The water tank 220 comprises a generally cylindrical body 221 which may be right circular or a frustum as desired for aesthetic reasons. The tank comprises an inlet for filling the tank with water which is closed off in use by a manually removable lid 222. An outlet is provided towards a lower end of the tank which communicates with the water pump 230. The water tank 220 may be made from a transparent or translucent material to allow a consumer to view the quantity of water remaining in the tank. Alternatively, the water tank 220 may be made from an opaque material but have provided a viewing window therein. In addition, or in place of the above, the water tank 220 may be provided with a low level sensor which prevents operation of the water pump 230 and optionally triggers a warning indicator, such as an LED, when the water level in the tank descends to a preselected level. The water tank 220 preferably has an internal capacity of approximately 1.5 litres.

40 [0098] The water pump 230 is operatively connected between the water tank 220 and the water heater 225 as shown schematically in Figure 43 and is controlled by the control processor. The pump provides a maximum flow rate of 900 ml/min of water at a maximum pressure of 2.5 bar. Preferably, in normal use, the pressure will be limited to 2 bar. The flow rate of water through the machine 201 can be controlled by the control processor to be a percentage of the maximum flow rate of the pump by cycle chopping the electrical supply to the pump. Preferably the pump can be driven at any of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or 100% of the maximum rated flow rate. The accuracy of the volume of water pumped is preferably + or - 5% leading to a + or - 5% accuracy in the final volume of the dispensed beverage.

50 A suitable pump is the Evolution EP8 pump produced by Ulka S.r.l. (Pavia, Italy). A volumetric flow sensor (not shown) is preferably provided in the flow line either upstream or downstream of the water pump 230. Preferably, the volumetric flow sensor is a rotary sensor.

55 [0099] The water heater 225 is located in the interior of the housing 210. The heater 225 has a power rating of 1550 W and is able to heat water received from the water pump 230 from a starting temperature of approximately 20 °C to an operating temperature of around 85 °C in under 1 minute. Preferably the dwell time between the end of one dispense cycle and the heater 225 being able to commence a subsequent dispense cycle is less than 10 seconds. The heater maintains the selected temperature to within + or - 2 °C during the dispense cycle. As discussed below, the water for the dispense cycle may be delivered to the cartridge head 250 at 83 °C or 93 °C. The heater 225 is able to quickly adjust

EP 1 440 913 B1

the delivery temperature to either 83 °C or 93 °C from a nominal water temperature of 85 °C. The heater 225 comprises an over-temperature cut-off which shuts off the heater if the temperature exceeds 98 °C. Water output from the heater 225 is fed to the cartridge head 250 and cartridge 1 by means of a three-way valve. If the pressure of the water flow is acceptable the water is passed to the cartridge 1. If the pressure is below or above predetermined limits then the water is diverted by means of the three-way valve into the drip tray recovery receptacle 270.

[0100] The air compressor 235 is operatively connected to the cartridge head 250 by means of a one-way valve and controlled by the control processor. The air compressor 235 provides a maximum flow rate of air of 500 ml/min at 1.0 bar. In use a working volume of 35 ml is pressurised to 2.0 bar. Preferably, the air compressor 235 can produce two flow rates: a fast (or maximum) flow rate and a slow flow rate.

[0101] The control processor of the beverage preparation machine 201 comprises a processing module and a memory. The control processor is operatively connected to, and controls operation of, the water heater 225, water pump 230, air compressor 235 and user interface 240.

[0102] The memory of the control processor includes one or more variables for one or more operational parameters for the beverage preparation machine 201. In the illustrated embodiment the operational parameters are the temperature of the water passed through the beverage cartridge 1 during the operating stage, the speed of charging the beverage cartridge 1, the presence or otherwise of a soak step, the total dispensed volume of the beverage, the flow rate of the water during the discharge stage, and the flow rate and period of the purge stage.

[0103] The variables for the operational parameters are stored in the memory. The cartridge 1 comprises a code provided on or in the cartridge 1 representing the operational parameters required for optimal dispensation of the beverage in that cartridge 1. The code is in binary format and comprises a plurality of data bits corresponding to the variables stored in the control processor memory. Table 3 illustrates how 13 bits of data can be used to represent the necessary variables for the operational parameters described above.

Table 3.

Bit	Parameter	Description
0 & 1	Water temperature	00 = cold 01 = warm 10 = 83 °C 11 = 93 °C
2 & 3	Cartridge charge	00 = fast charge with soak 01 = fast charge without soak 10 = slow charge with soak 11 = slow charge without soak
4, 5, 6 & 7	Beverage volume	0000 = 50 ml 0001 = 60 ml 0010 = 70 ml 0011 = 80 ml 0100 = 90 ml 0101 = 100 ml 0110 = 110 ml 0111 = 130 ml 1000 = 150 ml 1001 = 170 ml 1010 = 190 ml 1011 = 210 ml 1100 = 230 ml 1101 = 250 ml 1110 = 275 ml 1111 = 300 ml
8, 9 & 10	Flow rate	000 = 30% 001 = 40% 010 = 50% 011 = 60%

EP 1 440 913 B1

Table continued

Bit	Parameter	Description
		100 = 70% 101 = 80% 110 = 90% 111 = 100%
11 & 12	Purge	00 = slow flow/short period 01 = slow flow/long period 10 = fast flow/short period 11 = fast flow/long period

[0104] The code on or in the cartridge 1 will normally comprises one or more extra data bits for error checking. In one example a 16 bit code is provided. For example, using the variables listed in Table 3, a cartridge 1 bearing the code "1000100011110" would have the following operational parameters:

10	Water temperature of 83 °C
00	Fast charge with soak
1000	Dispensed drink volume of 150ml
111	Flow rate equals 100%
10	Fast air flow purge/short period.

[0105] Thus, unlike in previous beverage preparation machines, the memory of the control processor does not store operational instructions for beverage cartridges based on the cartridge type, i.e. instructions for a coffee cartridge, instructions for a chocolate cartridge, instructions for a tea cartridge etc. Instead the memory of the control processor stores variables for adjusting the individual operational parameters of the dispense cycle. This has a number of advantages. Firstly, a greater degree of control of the dispensation cycle can be exercised. For example, slightly different operational parameters can be used for different grades or blends of coffee rather than using the same parameters for all types of coffee. Prior coding solutions relying on storing instructions by cartridge type rather than by individual parameters are unsuited to such subtle differences in dispense cycles for similar beverage types because they quickly consume the available storage space in the coding medium and control processor. Secondly, the coding method of the present invention allows for new beverage cartridge types to be used in pre-existing beverage preparation machines even where the operational parameters for the dispense cycle for the new beverage cartridge 1 are only decided upon after sale of the beverage preparation machine 201. This is because the control processor of the beverage preparation machine 201 does not need to recognise that the beverage is of a new type. Rather the operational parameters of the dispense cycle are set without direct reference to the beverage type. Hence the coding method of the present invention provides excellent backward compatibility of the beverage preparation machines for new beverage types. In contrast, with prior machines, the manufacturer is restricted to dispensing a new beverage type using one of the pre-existing dispensation cycles as determined by the in-market machines.

[0106] The cartridge head 250 is shown in Figures 39 to 42. The cartridge holder 251 of the cartridge head 250 comprises a fixed lower part 255, a rotatable upper part 256 and a pivotable cartridge mount 257 positioned inbetween the fixed lower part 255 and the rotatable upper part 256. The upper part 256, lower part 255 and cartridge mount 257 are rotated about a common hinge axis 258. Figures 39 to 42 show the cartridge holder 251 with some components of the machine 201 omitted for clarity.

[0107] The rotatable upper part 256 and pivotable cartridge mount 257 are moved relative to the fixed lower part 255 by means of a clamping mechanism 280. The clamping mechanism 280 comprises a clamping lever having first and second members or parts 281 and 282. The first part 281 of the clamping lever comprises a U-shaped arm which is pivotably mounted to the upper part 256 at two first pivot points 283, one on each side of the cartridge holder 251.

[0108] The second part of the clamping lever comprises two over-centre arms 282, one on each side of the cartridge holder 251 which are each pivotably mounted to the upper part 256 at a second pivot point 285 located on the hinge axis 258 coupling the upper part 256 to the fixed lower part 255. Each over-centre arm 282 is a reciprocal member comprising a cylinder 282a, a stem 282b and a resilient sleeve 282c. The cylinder 282a has an internal bore and is rotatably mounted at one end at the hinge axis 258. A first end of the stem 282b is slidably received in the bore of the cylinder 282a. The opposite end of the stem 282b is rotatably mounted to the U-shaped arm 281 at a third pivot point 286. The third pivot points 286 are unconnected to, and freely moveable relative to, the upper part 256 and lower part 255. The resilient sleeve 282c is mounted externally on the stem 282b and extends, in use, between abutment surfaces

EP 1 440 913 B1

on the cylinder 282a and stem 282b. The resilient sleeve 282c accommodates shortening of the over-centre arm 282 but biases the over-centre arm 282 into an extended configuration. Movement of the third pivot points 286 towards and away from the hinge axis 258 is thus possible by relative movement of the stems 282b in the cylinders 282a. The resilient sleeves 282c are preferably formed from silicone.

5 [0109] The U-shaped arm 281 extends around the front of the cartridge holder 251 and comprises two downwardly dependant hook members 287, one on each side of the cartridge holder 251, each comprising a cam surface 288 facing the hinge axis 258. The fixed lower part 255 of the cartridge holder 251 is provided with two bosses 259, or detents, located one on each side of the lower part 255 at or near a front edge 260 thereof aligned generally with the hook members 287.

10 [0110] As shown in Figure 39, the U-shaped arm 281 may be formed from a one piece plastics moulding comprising an ergonomic hand grip and the hook members 287 integral to the arm.

[0111] The cartridge mount 257 is rotatably mounted between the upper and lower parts 255, 256 of the cartridge holder 251. The mount 257 is provided with a substantially circular recess 290 which receives in use the beverage cartridge 1. The recess 290 includes an irregularity 291 for accommodating the handle portion 24 of the beverage cartridge 1 which also acts to prevent rotation of the beverage cartridge 1 in the cartridge holder 251. The cartridge mount 257 is sprung relative to the fixed lower part 255 such that in the open position, as shown in Figure 41, the cartridge mount 257 is biased out of contact with the fixed lower part 255 so that the cartridge mount 257 is moved out of contact with the outlet and inlet piercer members 254, 253. The cartridge mount 257 is provided with an aperture 292 for receiving therethrough the inlet and outlet piercers 253, 254 and a head 300 of the cartridge recognition means 252 when the cartridge mount 257 is moved into the closed position.

20 [0112] The upper part 255 comprises a generally circular body 310 housing a circular viewing window 312 through which a consumer can view the beverage cartridge 1 during a dispense cycle and also visually confirm whether a cartridge 1 is loaded in the machine 201. The viewing window 312 is cup-shaped having a downwardly directed rim 311 which engages and grips the flange 35 of the beverage cartridge 1 against the lower part 256 when the cartridge holder 251 is closed. At the same time the window 312 contacts the closed top 11 of the cartridge 1. A wave spring (not shown) is positioned between the viewing window 312 and the circular body 310 to enable the viewing window 312 to move axially relative to the circular body 310 by a small degree. The pressure exerted by the rim 311 on the flange 35 and by the window 312 on the closed top 11 ensures a fluid tight seal between the cartridge 1 and the cartridge holder 251.

25 [0113] The lower part 255 comprises the inlet and outlet piercers 253, 254 and the head 300 of the cartridge recognition means 252. The inlet piercer 253 comprises a hollow needle-like tube 260 having a sharpened end 261 for perforating the laminate 5 of the beverage cartridge 1 in use. The inlet piercer 253 is in fluid communication with a water conduit 262 as shown in Figure 42 which passes through the lower part 255 and is connected to an outlet conduit 263 of the water heater 225. The outlet piercer 254 is similar in type to the outlet piercer described in the applicant's European patents EP 0 389 141 and EP 0 334 572 and comprises an open ended cylinder 264 of circular or D-shaped cross-section having dimensions larger than the discharge spout 43. An arcuate portion 265 of the upper end of the outlet piercer 254 is serrated to pierce and eventually cut the laminate of the beverage cartridge 1. The remainder of the upper end is cut back longitudinally of the cylinder at least to the base of the teeth 266 of the serrated portion to fold or pull the cut laminate 5 away from the outlet aperture before the beverage is dispensed therethrough. The outlet piercer 254 pierces the laminate 5 externally of the discharge spout 43 and when the cartridge mount 257 is in the closed position, rests in the annulus between the discharge spout 43 and the outer wall 42 of the discharge funnel 40. The outlet piercer 254 folds back the cut laminate 105 into the annulus. Thereby both the outlet piercer 254 and the cut laminate 105 are held out of the way of the discharged beverage.

[0114] The outlet piercer 254 is surrounded by a ledge 254a which is raised relative to its surroundings by 0.5mm.

45 [0115] Advantageously, the outlet piercer 254 is removable from the lower part 255 to enable it to be thoroughly cleaned, for example, in a dishwasher. The removable outlet piercer 254 is received in a recess 267 in the lower part 255 where it is seated. The inlet piercer 253 and/or the outlet piercer 254 may be made of a metal, such as stainless steel, or from a plastics material. Advantageously, the use of plastic cutting elements is enabled by use of a laminate 5 which is able to be punctured and cut by a non-metallic material. Consequently, the piercers 253, 254 can be made less sharp which lowers the risk of injury to the consumer. In addition, plastic piercing elements are not prone to rust. Preferably, the inlet piercer 253 and the outlet piercer 24 are formed as a single, integral unit which is removable from the lower part 255.

50 [0116] In use, the upper part 256 of the cartridge holder 251 is movable from an open position in which it is orientated vertically or towards the vertical as shown in Figure 36, to a closed position in which it is orientated substantially horizontally and in interengagement with the fixed lower part 255 and cartridge mount 257. The upper part 256 is moved from the open to the closed positions by operation of the clamping lever. To close the upper part 256 a user takes hold of the clamping lever by the U-shaped arm 281 and pulls downwards. Consequently, the upper part 256 rotates which first brings the rim 311 of the viewing window 312 into contact with the flange 35 of the beverage cartridge 1 in the cartridge mount 257 and the window 312 itself into contact with the closed top 11 of the cartridge 1. Continued rotation of the

EP 1 440 913 B1

upper part 256 rotates the upper part 256 and cartridge mount 257 down into contact with the lower part 255. Further rotation of the U-shaped arm 281 causes the U-shaped arm 281 to rotate relative to the upper part. 256 and the lower part 255 resulting in the hook members 287 of the upper part 256 engaging the bosses 259 of the lower part 255 with the cam surface 288 riding over the bosses 259. During this last stage of rotation the cartridge 1 is compressed between the cartridge mount 257 and the viewing window 312. As a result, the viewing window 312 is moved axially relative to the circular body 310 of the upper part 256 against the bias of the wave spring. This movement allows for a take up of tolerances in the beverage cartridge 1 and beverage preparation machine and ensures that the amount of compressive force applied to the cartridge is kept within an acceptable range. The clamping force of the mechanism as moderated by the action of the wave spring ensures a clamping pressure on the cartridge of between 130 and 280N. Preferably the force is approximately 200N. A force less than about 130N does not provide an adequate seal, whilst a force greater than about 280N leads to plastic failure of the components of the cartridge 1. During closure of the cartridge head the laminate 5 of the cartridge 1 is tensioned as it is brought into contact with the ledge 254a surrounding the outlet piercer 254 which causes the laminate 5 to flex out of plane as the distal end of the outer tube 42 of the cylindrical funnel is moved upwardly by 0.5mm relative to the flange 35. This movement also ensures that the great majority of the compressive force applied to the cartridge acts through the central region of the cartridge 1 through the load-bearing inner member 3. In the closed position the cartridge 1 is thus clamped around the flange 35 by means of the rim 311 of the viewing window 312 and firmly clamped between the closed top 11 of the cartridge and the outer tube 42 of the inner member 3 by contact with the viewing window 312 and the ledge 254a. These clamping forces help prevent failure of the cartridge 1 during pressurisation and also ensure that the inner member 3 and outer member 2 are fully seated relative to one another and thus that all internal passageways and apertures remain at their intended dimensions even during internal pressurisation.

[0117] An imaginary datum line can be drawn between the first and second pivot points 283, 285 of the cartridge holder 251. As can be seen in Figure 41, in the open position the third pivot points 286 are located on the side of the datum line nearest the fixed lower part 255. As the upper part 256 reaches the closed position, the third pivot points 286 of the clamping lever pass through the datum line joining the first and second pivot points 283, 285 to the opposite side of the line, furthest from the fixed lower part 255. Consequently, the U-shaped arm 281 'snaps through' from a first stable position to a second stable position. The snap through action is accommodated by shortening of the over-centre arms 282 and consequential compression of the resilient sleeves 282c. Once the third pivot points 286 are past the imaginary datum line then recovery of the resilient sleeves 282c acts to continue the motion of the third pivot points 286 away from the imaginary datum line. The clamping lever thus has a bi-stable operation in that the lever is stable in the open or closed positions but unstable at the point when the third pivot points 286 lie on the imaginary datum line joining the first and second pivot points 283, 285. Thus, the snap-through action of the clamping lever provides a positive closure mechanism which leads to a definite closure action wherein in the final stages of the clamping lever's rotation, the snap-through action of the U-shaped arm 281 and second arms 284 forces the hook members 287 firmly into engagement with the bosses 259. In addition, the resilient sleeves 282c provide a resistance to re-opening of the upper part 256 since a minimum force is required to compress the sleeves 282c sufficiently to move the third pivot points 286 back into line with the datum line joining the first and second pivot points 283, 285. Advantageously, the interengagement of the hook members 287 and the bosses 259 prevents separation of the upper and lower parts other than by rotation of the clamping lever. This is useful in preventing opening of the cartridge head 250 during operation when the cartridge head 250 is subject to internal pressurisation.

[0118] The purpose of the cartridge recognition means 252 is to allow the machine 201 to recognise the type of beverage cartridge 1 that has been inserted and to adjust one or more operational parameters accordingly. In a typical embodiment, the cartridge recognition means 252 comprises an optical barcode reader which reads a printed barcode 320 provided on the laminate 5 of the beverage cartridge 1 as shown in Figure 45. The barcode 320 is formed from a plurality of bars of contrasting colour. Preferably the bars are black on a white background to maximise the contrast. The barcode 320 is not required to conform to a published standard but a standard format for barcodes, such as EAN-13, UPC-A, or Interleaved 2 of 5 may be used. The optical barcode reader comprises one or more LEDs 321 to illuminate the barcode 320, a focusing lens 322 to acquire an image of the barcode, a charge coupled device (CCD) 323 for producing an electrical signal representative of the acquired image and support circuitry for the LEDs and CCD. The space in the lower part for accommodating the barcode reader is limited. A mirror or mirrors 324 may be used to reflect the light from the LEDs 321 to a focussing lens which is not located in the lower part 255. Schematic arrangements are shown in Figures 44a and 44b. The lower part 255 comprises an aperture 326 which is the same size as the barcode 320 on the beverage cartridge 1. In use the electrical signals produced are decoded by signal processing software and the results forwarded to the control processor. The software can recognise whether the read of the barcode contained errors. The barcode 320 may be rescanned a number of times before an error message is presented to the consumer. If the machine 201 is unable to read the barcode the consumer is able to use the beverage cartridge 1 to dispense a beverage using a manual mode of operation.

[0119] The cartridge head 250 also includes a cartridge sensor for detecting whether a cartridge is present in the

EP 1 440 913 B1

cartridge holder 251.

[0120] The cartridge head 250 also includes a lock sensor which detects whether the cartridge holder 251 is properly closed. Preferably the lock sensor comprises a micro-switch which is triggered when the cartridge holder 251 is closed and locked. Preferably the cartridge sensor and lock sensor are connected in series such that the output of both sensors must be satisfactory, i.e. cartridge present and mechanism locked, before the dispense cycle can be commenced.

[0121] Operation of the machine 201 comprises insertion of a beverage cartridge 1 into the cartridge head 250, carrying out a dispense cycle in which the beverage is dispensed and removal of the cartridge 1 from the machine.

[0122] The operational behaviour of the machine 201 is determined by software embedded in the control processor. Operation of the machine can be described in terms of 'States', wherein the machine 201 will normally exist in a particular State until an event occurs to change the State, a step called a State transition.

[0123] Table 4 shows a State Transition Table which illustrates the States and State transitions for one embodiment of the beverage preparation machine 201.

EP 1 440 913 B1

Table 4

State	State Description	Temperature	Lock Sensor	Cartridge Sensor variable (OK, NOK, CLR)	Water level indicator	Water flow rate	StartStop
1	WATER HEATING	> or = 85 goto 2	Closed: [Cartridge Sensor = readpod()] Open: [Cartridge Sensor = CLR]	N/A	Low goto 10	N/A	No Action
2	WATER READY If timeout 10mins goto 9	< 85 goto 2	Closed: [Cartridge Sensor = readpod()] Open: [Cartridge Sensor = CLR]	Cartridge Sensor = OK goto 4 Cartridge Sensor = NOK goto 3	Low goto 10	N/A	No Action
3	READY TO BREW AUTO	N/A [temperature controlled in background]	Open: [Cartridge Sensor = CLR] goto 2	N/A	Low goto 10	N/A	Goto 5
4	BREW IN PROGRESS AUTO [Run Brew State] goto 7	N/A [temperature controlled in background]	Open: [Cartridge Sensor = CLR] goto 10	N/A	Low goto 10	No flow goto 10	Water off goto 6
5	BREW SUSPENDED	N/A [temperature controlled in background]	Open: [Cartridge Sensor = CLR] goto 10	N/A	Low goto 10	N/A	Goto 5
6	READY TO BREW MANUAL	N/A [temperature controlled in background]	Open: [Cartridge Sensor = CLR] goto 2	N/A	Low goto 10	N/A	[Water On] Goto 8

EP 1 440 913 B1

7	BREW IN PROGRESS MANUAL	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	Low goto 10	No flow goto 10	Release d goto 7
8	PURGE [Water off; air on, timeout n sec then goto 9]	N/A [temperature controlled in background]	Open: [Cartridge Sensor =CLR] goto 10	N/A	No action	N/A	No Action
9	BREW DONE [air purge] [Cartridge Sensor =CLR] if timeout 10s goto 2	N/A [temperature controlled in background]	Open goto 2	N/A	Low goto 10	N/A	Goto 9
10	STANDBY	N/A [heater off]	Open: [Cartridge Sensor =CLR] goto 1 Closed: [Cartridge Sensor = readpod()]	N/A	Low goto 10	N/A	Goto 1
11	ERROR Power off/on required to clear	N/A	N/A	N/A	N/A	N/A	N/A
12	WATER LOW				Low goto 10		

[0124] The following example illustrates a dispense cycle to exemplify the use of the State Transitions by the control processor.

[0125] It is assumed that the machine 201 is initially switched off and with no cartridge 1 inserted in the cartridge head 250. When the machine 201 is switched on the control processor is in State 1. The water heater 225 is switched on. Once the temperature reaches 85 °C the control processor transits to State 2. If at any time during State 1 or 2 the cartridge holder 251 is closed the lock sensor will be triggered to send a signal to the control processor indicating that the cartridge holder 251 is properly closed. The control processor then interrogates the cartridge sensor by sending a 'readpod' instruction. The cartridge sensor returns a signal to the control processor indicating whether a cartridge is in place in the cartridge holder 251. If no cartridge is present the control processor transits to State 3 where it remains in a readiness state until the cartridge holder 251 is reopened at which point the control processor transits back to State 2. If a cartridge is present in State 2 then the control processor transits to State 4 and operation is commenced automatically. During States 4 to 9 the water temperature is controlled in the background to remain within the required tolerance range of the desired temperature as set by the operational parameters set by the barcode on the beverage cartridge 1. Once the discharge stage of dispense is completed an air purge is commenced in State 8. Once the air purge is completed the operating cycle is completed and the machine enters to standby mode in State 10. If, during operation, an error occurs then the processor transits to State 11. If a low water level is detected then the processor transits to State 12.

[0126] To insert the cartridge 1 the cartridge holder 251 is opened as described above to expose the cartridge mount

EP 1 440 913 B1

257. The cartridge 1 is then placed on the cartridge mount 257 received within the recess 290 such that the handle 24 of the cartridge is located in the irregularity 291. The optical or magnetic barcode 320 of the cartridge 1 is orientated directly above the aperture 326 in the cartridge mount 257. The cartridge holder 251 is then closed by operation of the clamping lever as described above. During closure the inlet and outlet piercers 253, 254 pierce the laminate 5 of the cartridge 1 to form the cartridge inlet 121 and outlet 122. It should be noted that the piercers 253, 254 remain static during the operation and it is the cartridge 1 which is moved relative to the piercers. As described above the laminate 5 cut by the outlet piercer 254 is folded up into the annulus surrounding the discharge spout 43. When closed the cartridge holder 251 grips the cartridge 1 around the rim 35 between the cartridge mount 257 and the upper part 256 and between the window 311 and the top 11 of the cartridge 1 to form a fluid tight seal of sufficient integrity to withstand the pressures developed during the dispense cycle.

[0127] To commence the operating cycle the consumer operates the start/stop button 241.

[0128] The operating cycle comprises the steps of cartridge recognition and the discharge cycle.

[0129] Cartridge recognition is performed by the optical cartridge recognition means 252 as described above assuming that the outputs from the cartridge sensor and lock sensor are satisfactory. Once the barcode 320 has been decoded the operational parameters of the machine 201 are adjusted by the control processor. The discharge cycle is then automatically commenced.

[0130] The discharge cycle has four main stages, not all of which are used for all beverage types:

- (i) Pre-wet
- (ii) Pause
- (iii) Brew/Mixing
- (iv) Purge

[0131] In the pre-wet stage the cartridge 1 is charged with water from the water storage tank 220 by means of the water pump 230. The charging with water causes the beverage ingredients 200 in the filtration chamber 130 to be wetted. The charging may take place at a "fast" flow rate of 600 ml/min or a "slow" flow rate of 325 ml/min. The slow charging rate is particularly useful for cartridges containing viscous liquid beverage ingredients where the ingredients require some dilution before they are able to be pumped at a higher volume flow rate. The volume of water injected into the cartridge 1 is selected to ensure that water or beverage does not drip out of the cartridge outlet 122 during this stage.

[0132] The pause stage allows the beverage ingredients 200 to soak in the water injected during the pre-wet stage for a predetermined period of time. Both the pre-wetting and soaking stages are known to increase the yield of the extractables from the beverage ingredients 200 and to improve the end flavour of the beverage. Pre-wetting and soaking are particularly used where the beverage ingredients are roast and ground coffee.

[0133] In the brew/mixing stage water is passed through the cartridge 1 in order to produce the beverage from the beverage ingredients 200. The temperature of the water is determined by the control processor which sends instructions to the water heater 225 to heat the water passing from the water tank 220 to the cartridge head 250. Water enters the lower part 255 of the cartridge holder 251 through the conduit 262 via the inlet valve and the inlet piercer 253 into the inlet chamber 126 of the beverage cartridge 1. Brewing and/or mixing and subsequent dispensing of the beverage from the beverage cartridge 1 is as described above with reference to the versions of the beverage cartridge 1.

[0134] The air purge comprises the blowing of pressurised air through the beverage preparation machine and the beverage cartridge 1 to ensure that all beverage is dispensed and that the flow path is cleared ready for dispensing another beverage. The air purge does not commence immediately on cessation of the brew/mixing stage to allow for the majority of the fluid to clear the flow path. This prevents an unacceptable spike in internal pressure on commencement of the air purge.

[0135] In normal operation a user manually stops the machine 201 by operating the start/stop button 241.

[0136] Once the operating cycle has been completed the consumer removes the cartridge 1 by opening the cartridge holder 251 and manually removing and disposing of the cartridge. Alternatively, the machine 201 may be provided with an automatic ejection mechanism for removing the cartridge automatically on opening the cartridge holder 251.

[0137] The delivery times for beverages using the machine 201 and cartridges 1 are typically between 10 and 120 seconds, preferably 30 to 40 seconds for roast and ground coffee, between 5 and 120 seconds, preferably 10 to 20 seconds for chocolate and between 5 and 120 seconds, preferably 10 to 20 seconds for milk.

[0138] The machine 201 may also advantageously comprise a memory in operative communication with the control processor that stores information on the type of beverage dispensed by a user. The operating cycle of the machine 201 may then be adjusted for the next cartridge 1. This is especially advantageous where two or more beverage cartridges 1 are used sequentially to form a beverage. For example a coffee cartridge may be dispensed followed by a milk cartridge to form a cappuccino beverage. Alternatively a chocolate cartridge could be used followed by a milk cartridge to produce a creamy hot chocolate beverage. By using a memory that stores information on the first beverage dispensed, the manner of dispensing the second cartridge, say a milk cartridge, may be altered to achieve an optimum beverage. In

EP 1 440 913 B1

the above example the milk dispensed for hot chocolate may, typically, be diluted less than the milk added to the coffee. In addition, the milk dispensed for chocolate may be dispensed at a slower flow rate to lessen the degree of foaming of the beverage. Many combinations of cartridges are possible and operating parameters as will be obvious to the skilled person. In addition, the memory may be used to allow the machine 201 to 'predict' the type of beverage that a user will next want to dispense. For example, if a user predominantly drinks one beverage type then the machine can instruct the water heater to remain at the optimum temperature for that beverage type.

Claims

1. A cartridge (1) containing one or more beverage ingredients (200) and being formed from substantially air- and water-impermeable materials, the cartridge defining a storage chamber (130; 134) containing the one or more beverage ingredients and a manifold chamber (16), the cartridge comprising an opening (12) through which the one or more beverage ingredients can be filled into the storage chamber, the opening being closed by a lid (5) having a first portion overlying the manifold chamber and a second portion overlying the storage chamber, characterised in that the first portion of the lid is pierceable in use to accommodate an inflow of an aqueous medium into the manifold chamber and the lid is pierceable in use to accommodate an outflow of beverage formed from interaction of the aqueous medium and the one or more beverage ingredients in the storage chamber.
2. A cartridge (1) as claimed in claim 1 further comprising a discharge chamber which is overlain by a third portion of the lid (5) which is pierceable in use to accommodate the outflow of beverage formed from interaction of the aqueous medium and the one or more beverage ingredients in the storage chamber.
3. A cartridge (1) as claimed in claim 2 wherein the discharge chamber comprises a discharge spout (43).
4. A cartridge (1) as claimed in any preceding claim wherein the manifold chamber (16) and the storage chamber (130; 134) are divided by a partition (27) comprising one or more apertures (17; 36).
5. A cartridge (1) as claimed in claim 4 wherein the apertures (17; 36) are sized to prevent passage of the one or more beverage ingredients from the storage chamber (130; 134) into the manifold chamber (16).
6. A cartridge (1) as claimed in any preceding claim wherein the manifold chamber (16) at least partially surrounds the storage chamber (130; 134).
7. A cartridge (1) as claimed in claim 6 wherein the manifold chamber (16) substantially encircles the storage chamber (130; 134).
8. A cartridge (1) as claimed in claim 4 wherein the manifold chamber (16) substantially encircles the storage chamber (130; 134) and the apertures (17; 36) are provided along substantially all of an interface between the manifold chamber and the storage chamber.
9. A cartridge (1) as claimed in any of claim 4 to 8 wherein the apertures (17; 36) have a width of between 0.25 and 0.35 mm.
10. A cartridge (1) as claimed in any of claims 4 to 9 wherein the apertures (17; 36) have a length of between 1.4 and 1.8 mm.
11. A cartridge (1) as claimed in any of claims 4 to 10 wherein between 20 and 40 apertures (17; 36) are provided.
12. A cartridge (1) as claimed in any preceding claim wherein the manifold chamber (16) comprises an inlet portion (26) into which the aqueous medium is introduced, wherein the inlet portion (26) communicates with the remainder of the manifold chamber (16) via one or more openings (30).
13. A cartridge (1) as claimed in claim 12 wherein the inlet portion (26) is circular.
14. A cartridge (1) as claimed in claim 2 wherein the storage chamber (130; 134) and the discharge chamber are divided by an inner member (3).

EP 1 440 913 B1

15. A cartridge (1) as claimed in claim 14 wherein the inner member (3) comprises one or more apertures (55; 85).
16. A cartridge (1) as claimed in claim 14 or claim 15 wherein the inner member (3) comprises a filter (4) to prevent passage of the one or more beverage ingredients (200) from the storage chamber (130; 134) into the discharge chamber while accommodating passage of the beverage therethrough.
17. A cartridge (1) as claimed in any of claims 14 to 16 wherein the lid (5) is joined to the outer member (2) and the inner member (3).
18. A cartridge (1) as claimed in claim 17 wherein the lid (5) is joined to the outer member (2) around a periphery of the cartridge and the lid is joined to the inner member (3) at or near a centre of the cartridge.
19. A cartridge (1) as claimed in claim 18 wherein the lid (5) is joined to a discharge funnel (43) of the inner member.
20. A cartridge (1) as claimed in any preceding claim wherein the outer member (2) has a greater rigidity than the lid (5).
21. A cartridge (1) as claimed in any preceding claim wherein the location of piercing of the lid to accommodate the inflow and outflow is such that aqueous medium passing through the cartridge moves generally inwardly from the inlet to the outlet.
22. A cartridge (1) as claimed in any preceding claim wherein the cartridge is shaped such that the aqueous medium passes through the storage chamber in a generally upwards direction.
23. A plurality of cartridges (1), each cartridge as claimed in any preceding claim, wherein the percentage yield of the beverage produced from the one or more beverage ingredients (200) contained in the cartridges is consistent to within a standard deviation of 1%.
24. A method of use of a cartridge as claimed in any preceding claim wherein the cartridge is displaced relative to one or more static piercing elements in order to form the inlet to, and outlet from, the cartridge.

Patentansprüche

1. Patrone (1), die eine oder mehrere Getränkezutaten (200) enthält und aus im Wesentlichen luft- und wasserundurchlässigen Materialien gebildet ist, wobei die Patrone eine die eine oder mehreren Getränkezutaten enthaltende Aufbewahrungskammer (130, 134) und eine Verteilerkammer (16) definiert, wobei die Patrone eine Öffnung (12) umfasst, durch welche die eine oder die mehreren Getränkezutaten in die Aufbewahrungskammer eingefüllt werden können, wobei die Öffnung von einem Deckel (5) verschlossen wird, der einen ersten, über der Verteilerkammer liegenden Abschnitt und einen zweiten, über der Aufbewahrungskammer liegenden Abschnitt aufweist, **dadurch gekennzeichnet, dass** der erste Abschnitt des Deckels im Gebrauch durchstechbar ist, um ein Einströmen eines wässrigen Mediums in die Verteilerkammer zu ermöglichen, und der Deckel im Gebrauch durchstechbar ist, um ein Ausströmen der Flüssigkeit zu ermöglichen, die durch Zusammenwirken des wässrigen Mediums und der einen oder den mehreren Getränkezutaten in der Aufbewahrungskammer gebildet wird.
2. Patrone (1) nach Anspruch 1, weiter eine Ausgabekammer umfassend, über der ein dritter Abschnitt des Deckels (5) liegt, der im Gebrauch durchstechbar ist, um die Ausströmung der Flüssigkeit zu erlauben, welche durch Zusammenwirken des wässrigen Mediums und der einen oder den mehreren Getränkezutaten in der Aufbewahrungskammer gebildet wird.
3. Patrone (1) nach Anspruch 2, wobei die Ausgabekammer eine Ausgabetülle (43) umfasst.
4. Patrone (1) nach einem der vorangehenden Ansprüche, wobei die Verteilerkammer (16) und die Aufbewahrungskammer (130, 134) von einer Trennwand (27) getrennt sind, die eine oder mehrere Öffnungen (17, 36) umfasst.
5. Patrone (1) nach Anspruch 4, wobei die Öffnungen (17, 36) so bemessen sind, dass sie den Durchtritt der einen oder der mehreren Getränkezutaten aus der Aufbewahrungskammer (130, 134) in die Verteilerkammer (16) verhindern.

EP 1 440 913 B1

6. Patrone (1) nach einem der vorangehenden Ansprüche, wobei die Verteilerkammer (16) mindestens teilweise die Aufbewahrungskammer (130, 134) umgibt.
- 5 7. Patrone (1) nach Anspruch 6, wobei die Verteilerkammer (16) im Wesentlichen die Aufbewahrungskammer (130, 134) umgibt.
8. Patrone (1) nach Anspruch 4, wobei die Verteilerkammer (16) im Wesentlichen die Aufbewahrungskammer (130, 134) umgibt und die Öffnungen (17, 36) im Wesentlichen entlang der gesamten Berührungsfläche zwischen der Verteilerkammer und der Aufbewahrungskammer vorgesehen sind.
- 10 9. Patrone (1) nach einem der Ansprüche 4 bis 8, wobei die Öffnungen (17, 36) eine Breite von zwischen 0,25 und 0,35 mm aufweisen.
- 10 10. Patrone (1) nach einem der Ansprüche 4 bis 9, wobei die Öffnungen (17, 36) eine Länge von zwischen 1,4 und 1,8 mm aufweisen.
- 15 11. Patrone (1) nach einem der Ansprüche 4 bis 10, wobei zwischen 20 und 40 Öffnungen (17, 36) vorgesehen sind.
12. Patrone (1) nach einem der vorangehenden Ansprüche, wobei die Verteilerkammer (16) einen Einlassabschnitt (26) umfasst, in welchen das wässrige Medium eingeführt wird, wobei der Einlassabschnitt (26) mit dem Rest der Verteilerkammer (16) über eine oder mehrere Öffnungen (30) in Verbindung steht.
- 20 13. Patrone (1) nach Anspruch 12, wobei der Einlassabschnitt (26) kreisförmig ist.
- 25 14. Patrone (1) nach Anspruch 2, wobei die Aufbewahrungskammer (130, 134) und die Ausgabekammer von einem inneren Element (3) getrennt sind.
15. Patrone (1) nach Anspruch 14, wobei das innere Element (3) eine oder mehrere Öffnungen (55, 85) umfasst.
- 30 16. Patrone (1) nach Anspruch 14 oder Anspruch 15, wobei das innere Element (3) einen Filter (4) umfasst, um den Durchtritt der einen oder der mehreren Getränkezutaten (200) aus der Aufbewahrungskammer (130, 134) in die Ausgabekammer verhindert, während der Durchtritt des Getränks hierdurch erlaubt wird.
- 35 17. Patrone (1) nach einem der Ansprüche 14 bis 16, wobei der Deckel (5) mit dem äußeren Element (2) und dem inneren Element (3) verbunden ist.
18. Patrone (1) nach Anspruch 17, wobei der Deckel (5) mit dem äußeren Element (2) um einen Rand der Patrone herum verbunden ist und der Deckel mit dem inneren Element (3) an oder in der Nähe einer Mitte der Patrone verbunden ist.
- 40 19. Patrone (1) nach Anspruch 18, wobei der Deckel (5) mit einer Ausgabetülle (43) des inneren Elements verbunden ist.
20. Patrone (1) nach einem der vorangehenden Ansprüche, wobei das äußere Element (2) eine größere Steifigkeit als der Deckel (5) aufweist.
- 45 21. Patrone (1) nach einem der vorangehenden Ansprüche, wobei die Stelle des Durchstechens des Deckels, um das Einströmen und Ausströmen zu erlauben, so ist, dass sich das durch die Patrone strömende wässrige Medium allgemein nach innen vom Einlass zum Auslass bewegt.
- 50 22. Patrone (1) nach einem der vorangehenden Ansprüche, wobei die Patrone so geformt ist, dass das wässrige Medium durch die Aufbewahrungskammer in eine allgemein nach oben zeigende Richtung durchtritt.
23. Vielzahl von Patronen (1), mit jeder Patrone entsprechend einem der vorangehenden Ansprüche, wobei die Prozentausbeute des Getränks, das aus der einen oder den mehreren in den Patronen enthaltenen Getränkezutaten (200) hergestellt ist, innerhalb von 1,0 Standardabweichungen übereinstimmt.
- 55 24. Verfahren zum Verwenden einer Patrone nach einem der vorangehenden Ansprüche, wobei die Patrone relativ zu einem oder mehreren statischen Stechelementen verschoben wird, um den Einlass und den Auslass in bzw. aus

EP 1 440 913 B1

der Patrone zu bilden.

Revendications

5

10

15

20

25

30

35

40

45

50

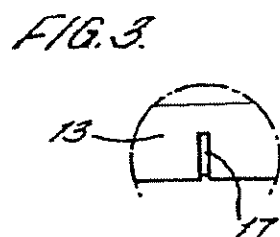
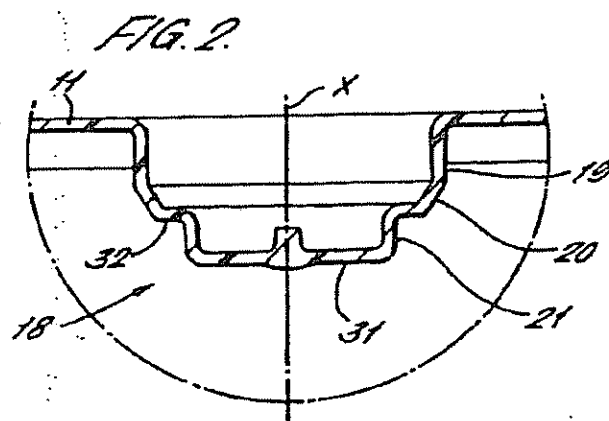
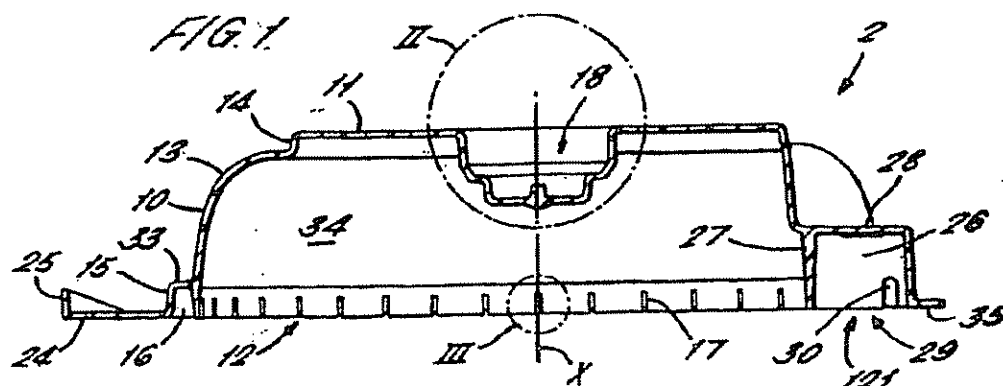
55

1. Cartouche (1) contenant un ou plusieurs ingrédients (200) de boisson et formée de matières sensiblement imperméables à l'air et à l'eau, la cartouche définissant une chambre d'emmagasinement (130 ; 134) contenant le ou les ingrédients de boisson et une chambre collectrice (16), la cartouche présentant une ouverture (12) à travers laquelle le ou les ingrédients de boisson peuvent être introduits dans la chambre d'emmagasinement pour la remplir, l'ouverture étant fermée par un couvercle (5) ayant une première partie s'étendant au-dessus de la chambre collectrice et une seconde partie s'étendant au-dessus de la chambre d'emmagasinement, **caractérisée en ce que** la première partie du couvercle peut être percée lors de l'utilisation pour permettre l'admission d'un milieu aqueux dans la chambre collectrice et le couvercle peut être percé lors de l'utilisation pour permettre l'écoulement d'une boisson formée par l'interaction du milieu aqueux et du ou des ingrédients de boisson dans la chambre d'emmagasinement.
2. Cartouche (1) selon la revendication 1, comportant en outre une chambre de décharge au-dessus de laquelle s'étend une troisième partie du couvercle (5) qui peut être percée lors de l'utilisation pour permettre l'écoulement d'une boisson formée par l'interaction du milieu aqueux et du ou des ingrédients de boisson dans la chambre d'emmagasinement.
3. Cartouche (1) selon la revendication 2, dans laquelle la chambre de décharge comporte un bec (43) de décharge.
4. Cartouche (1) selon l'une quelconque des revendications précédentes, dans laquelle la chambre collectrice (16) et la chambre (130 ; 134) d'emmagasinement sont séparées par une cloison (27) présentant un ou plusieurs orifices (17 ; 36).
5. Cartouche (1) selon la revendication 4, dans laquelle les orifices (17 ; 36) sont dimensionnés pour empêcher le passage du ou des ingrédients de boisson de la chambre d'emmagasinement (130 ; 134) dans la chambre collectrice (16).
6. Cartouche (1) selon l'une quelconque des revendications précédentes; dans laquelle la chambre collectrice (16) entoure au moins partiellement la chambre d'emmagasinement (130 ; 134).
7. Cartouche (1) selon la revendication 6, dans laquelle la chambre collectrice (16) entoure sensiblement la chambre d'emmagasinement (130 ; 134).
8. Cartouche (1) selon la revendication 4, dans laquelle la chambre collectrice (16) entoure sensiblement la chambre d'emmagasinement (130 ; 134) et les orifices (17 ; 36) sont situés sensiblement le long de la totalité d'une interface entre la chambre collectrice et la chambre d'emmagasinement.
9. Cartouche (1) selon l'une quelconque des revendications 4 à 8, dans laquelle les orifices (17 ; 36) ont une largeur comprise entre 0,25 et 0,35 mm.
10. Cartouche (1) selon l'une quelconque des revendications 4 à 9, dans laquelle les orifices (17 ; 36) ont une longueur comprise entre 1,4 et 1,8 mm.
11. Cartouche (1) selon l'une quelconque des revendications 4 à 10, dans laquelle entre 20 et 40 orifices (17 ; 36) sont prévus.
12. Cartouche (1) selon l'une quelconque des revendications précédentes, dans laquelle la chambre collectrice (16) comporte une partie d'entrée (26) dans laquelle le milieu aqueux est introduit, la partie d'entrée (26) communiquant avec la partie restante de la chambre collectrice (16) par une ou plusieurs ouvertures (30).
13. Cartouche (1) selon la revendication 12, dans laquelle la partie d'entrée (26) est circulaire.
14. Cartouche (1) selon la revendication 2, dans laquelle la chambre d'emmagasinement (130 ; 134) et la chambre de décharge sont séparées par un élément intérieur (3).

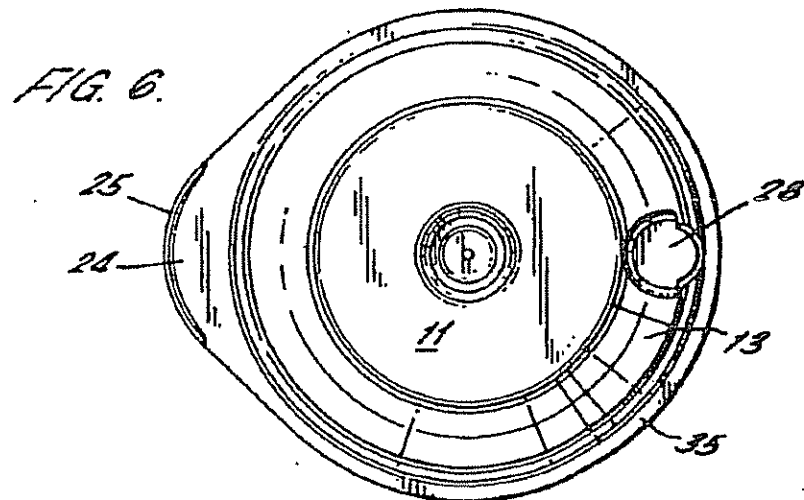
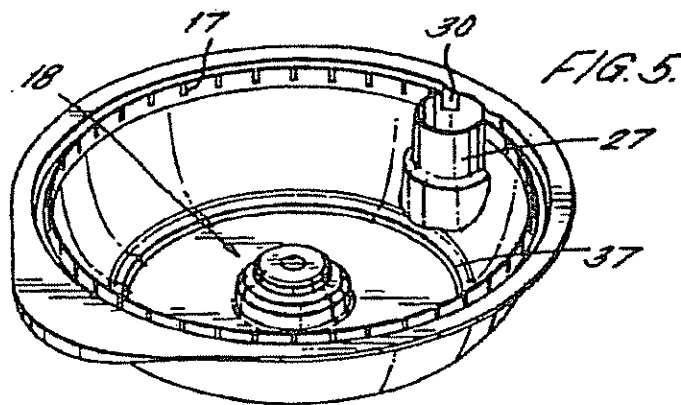
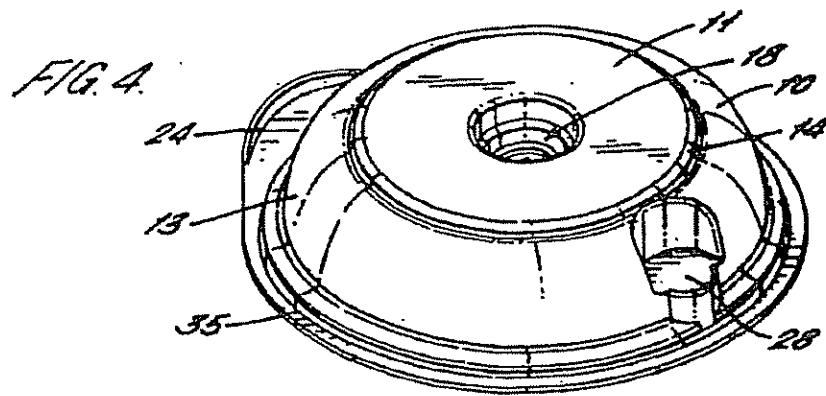
EP 1 440 913 B1

15. Cartouche (1) selon la revendication 14, dans laquelle l'élément intérieur (3) présente un ou plusieurs orifices (55 ; 85).
- 5 16. Cartouche (1) selon la revendication 14 ou la revendication 15, dans laquelle l'élément intérieur (3) comporte un filtre (4) pour empêcher le passage du ou des ingrédients (200) de boisson de la chambre d'emménagement (130 ; 134) dans la chambre de décharge tout en permettant à la boisson de le traverser.
- 10 17. Cartouche (1) selon l'une quelconque des revendications 14 à 16, dans laquelle le couvercle (5) est relié à l'élément extérieur (2) et à l'élément intérieur (3).
- 15 18. Cartouche (1) selon la revendication 17, dans laquelle le couvercle (5) est relié à l'élément extérieur (2) suivant une périphérie de la cartouche et le couvercle est relié à l'élément intérieur (3) au centre ou à proximité du centre de la cartouche.
- 20 19. Cartouche (1) selon la revendication 18, dans laquelle le couvercle (5) est relié à un entonnoir (43) de décharge de l'élément intérieur.
- 25 20. Cartouche (1) selon l'une quelconque des revendications précédentes, dans laquelle l'élément extérieur (2) a une plus grande rigidité que le couvercle (5).
- 30 21. Cartouche (1) selon l'une quelconque des revendications précédentes, dans laquelle la position de perçage du couvercle pour permettre l'admission et l'écoulement est telle qu'un milieu aqueux passant dans la cartouche se déplace généralement vers l'intérieur de l'entrée vers la sortie.
- 35 22. Cartouche (1) selon l'une quelconque des revendications précédentes, dans laquelle la cartouche est configurée de façon que le milieu aqueux passe à travers la chambre d'emménagement en se dirigeant globalement vers le haut.
- 40 23. Pluralité de cartouches (1), chaque cartouche telle que revendiquée dans l'une quelconque des revendications précédentes, dans laquelle le taux de rendement de la boisson produite à partir du ou des ingrédients (200) de boisson contenus dans les cartouches est constant avec un écart type de moins de 1 %.
- 45 24. Procédé d'utilisation d'une cartouche selon l'une quelconque des revendications précédentes, dans lequel la cartouche est déplacée par rapport à un ou plusieurs éléments statiques de perçage pour former l'entrée vers la cartouche et la sortie depuis celle-ci.
- 50
- 55

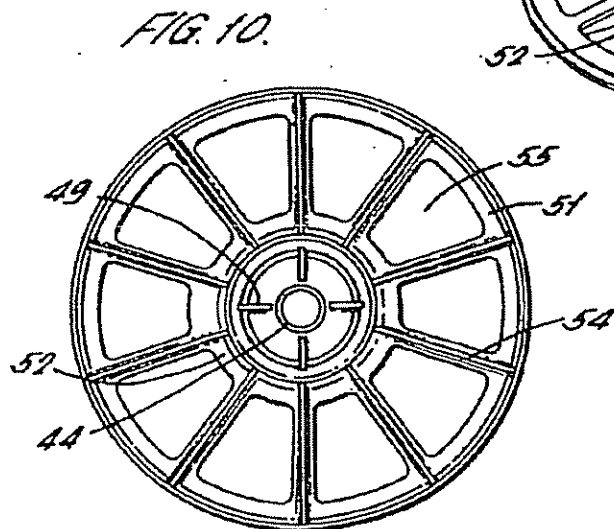
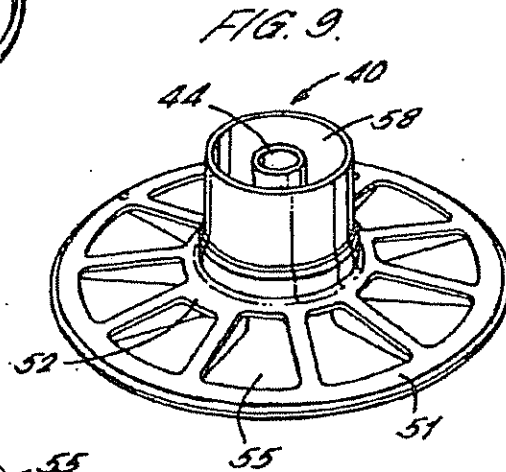
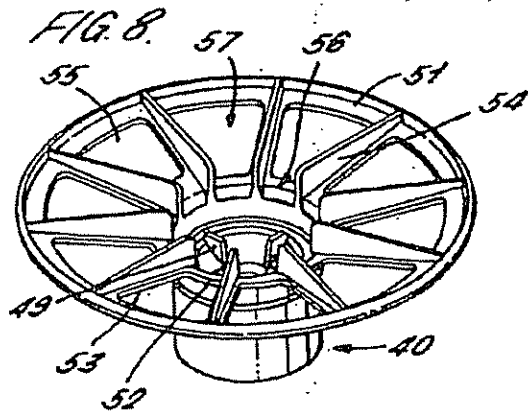
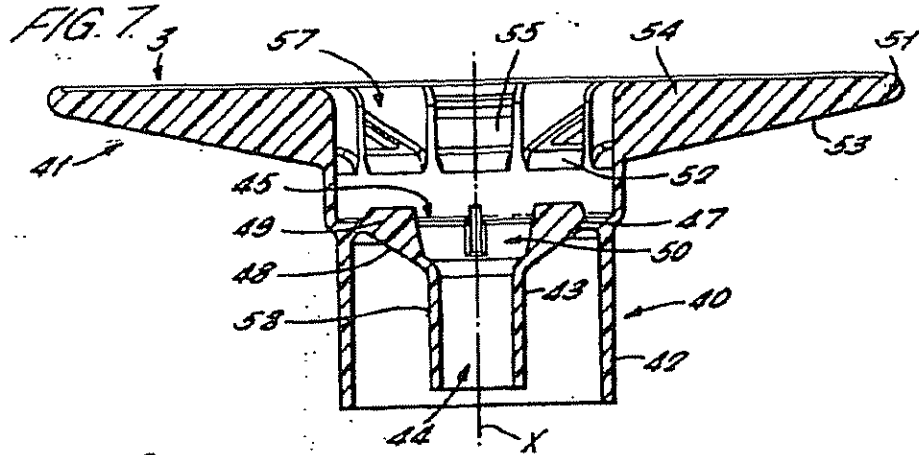
EP 1 440 913 B1



EP 1 440 913 B1

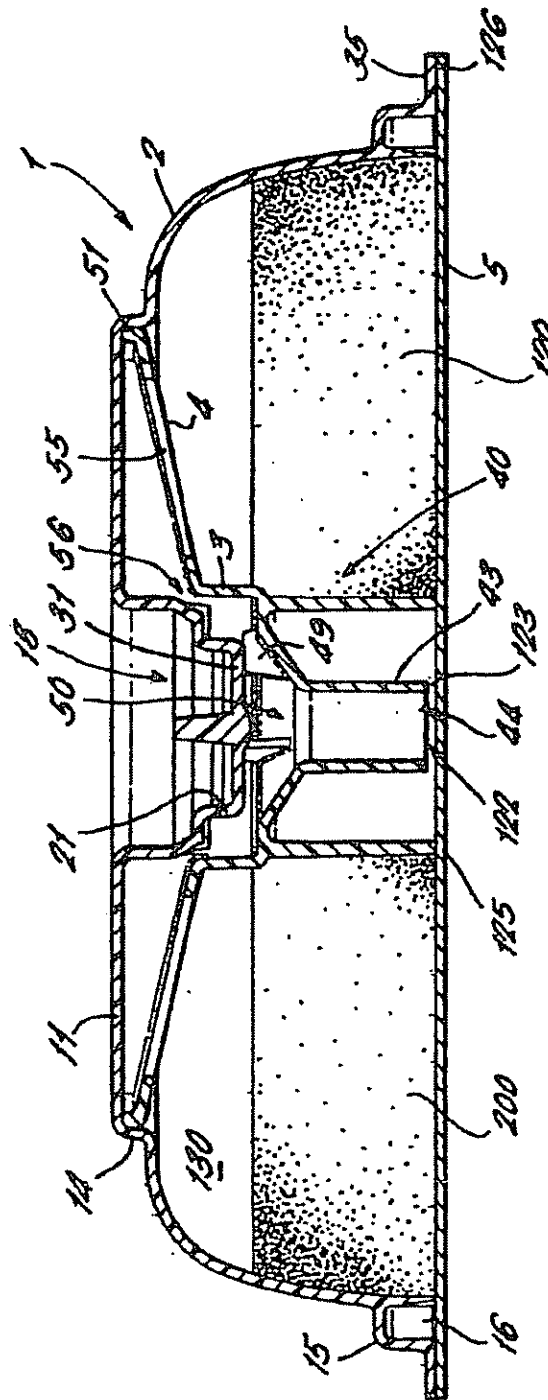


EP 1 440 913 B1

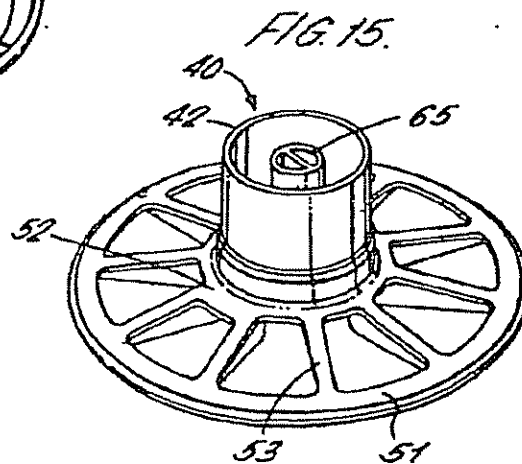
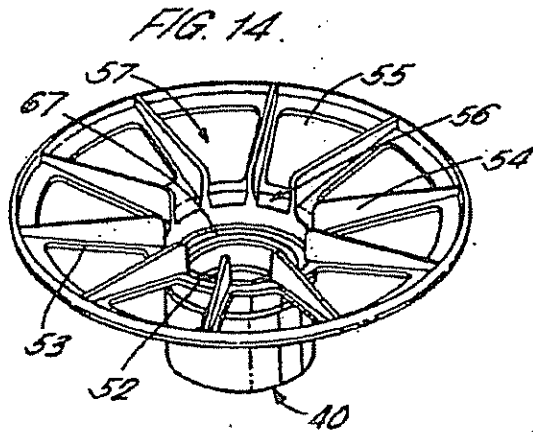
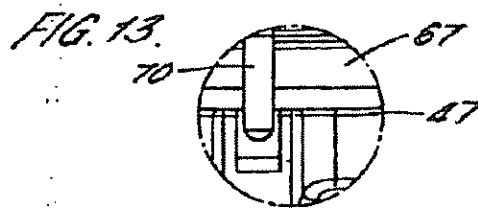
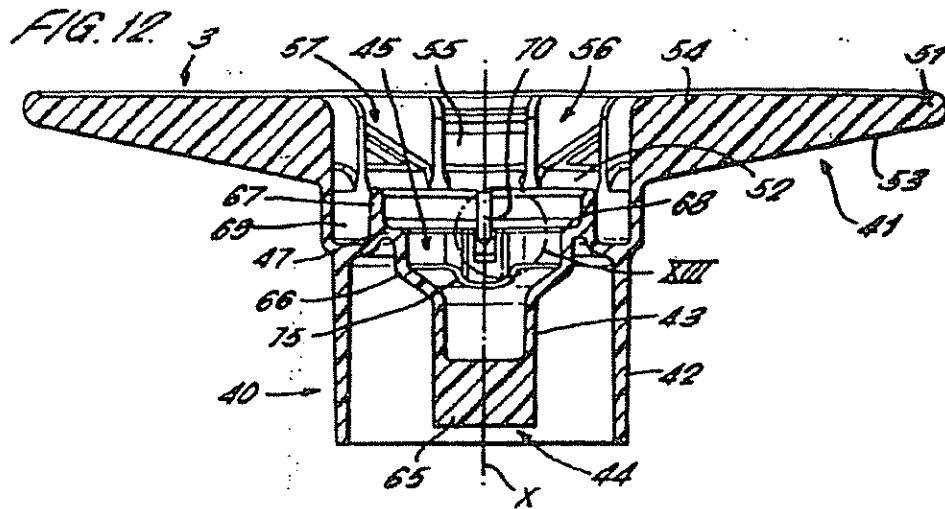


EP 1 440 913 B1

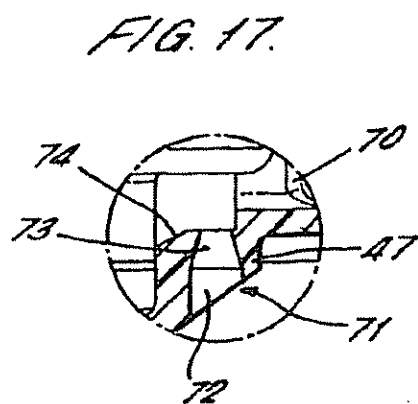
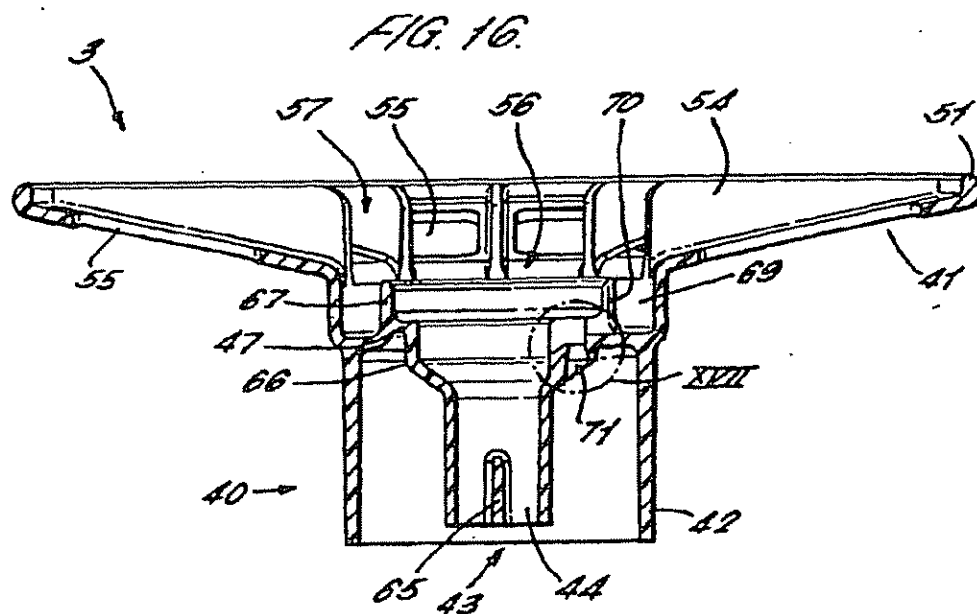
FIG. 11



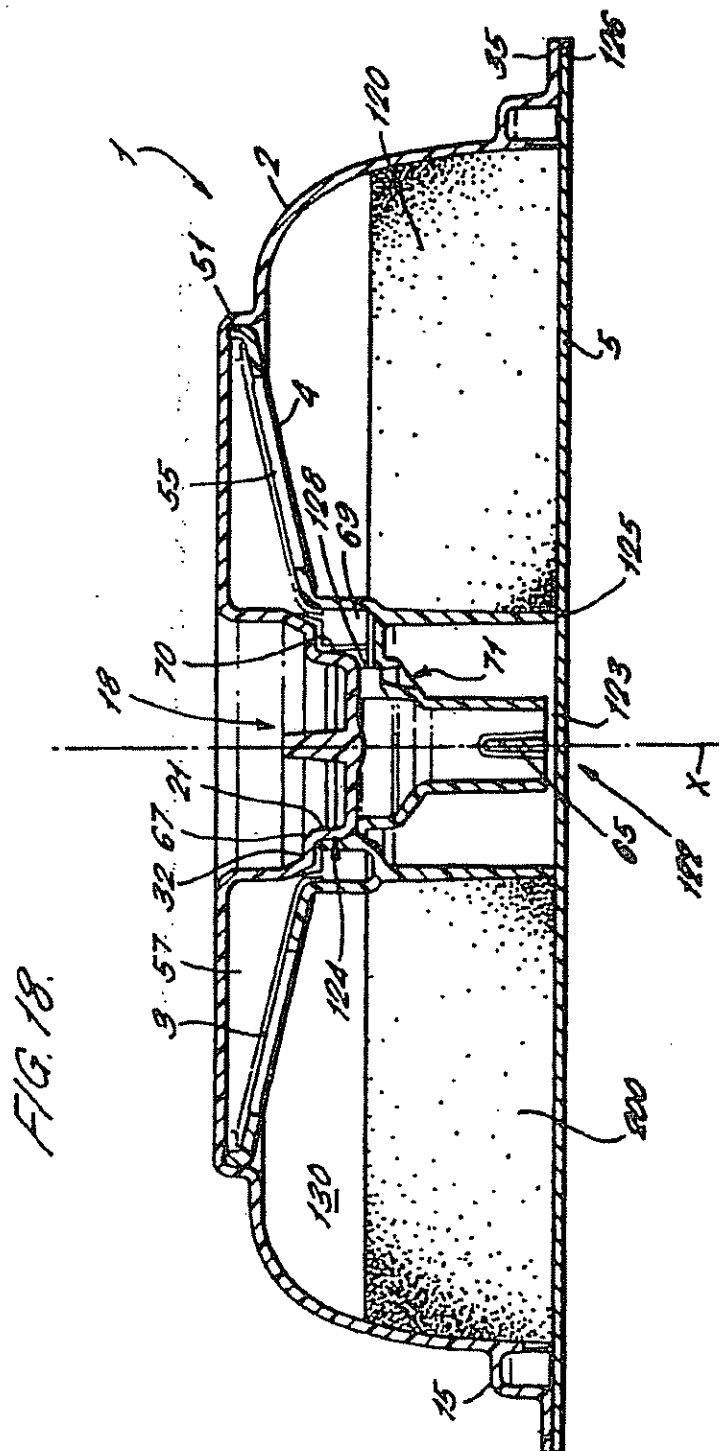
EP 1 440 913 B1



EP 1 440 913 B1



EP 1 440 913 B1



EP 1 440 913 B1

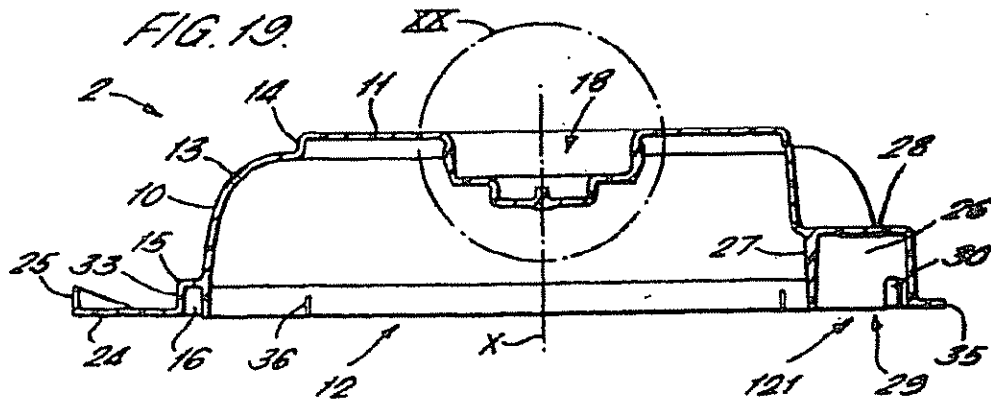
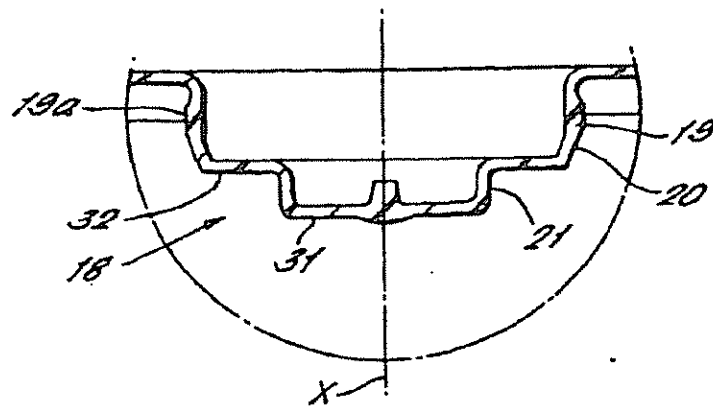
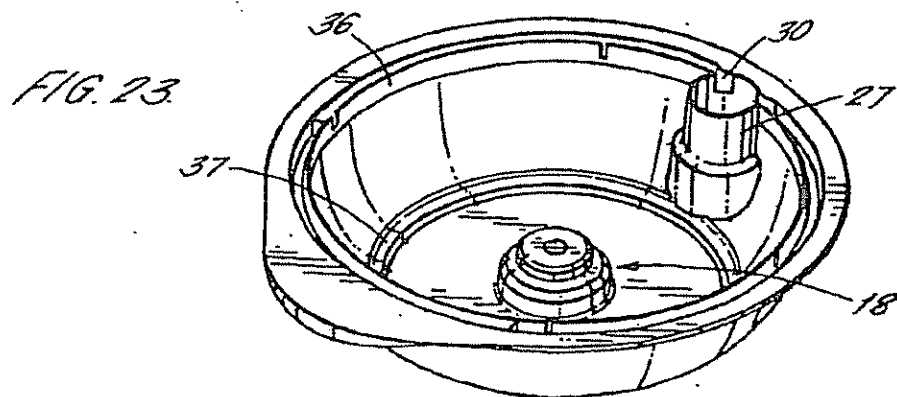
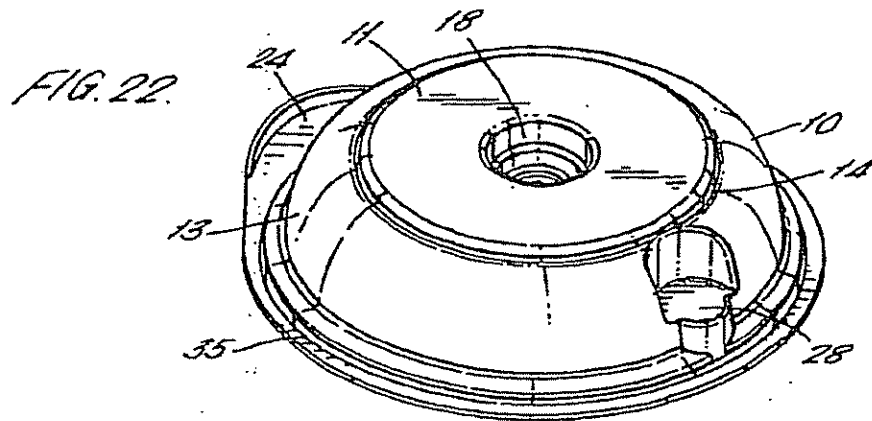
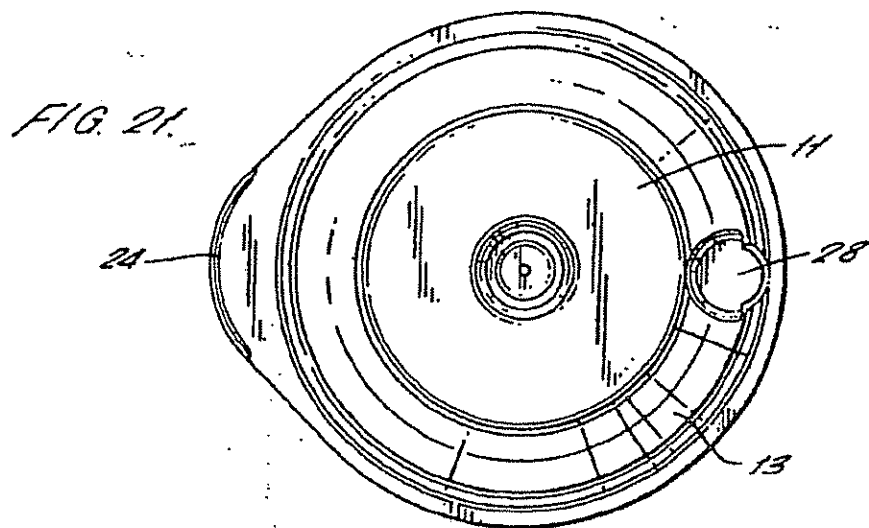


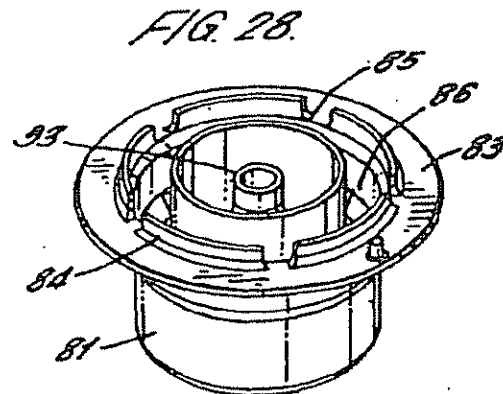
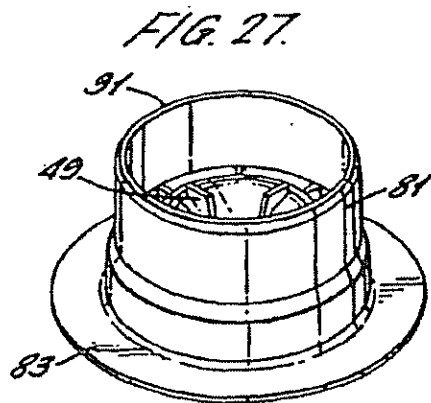
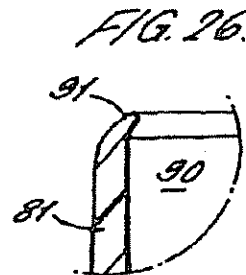
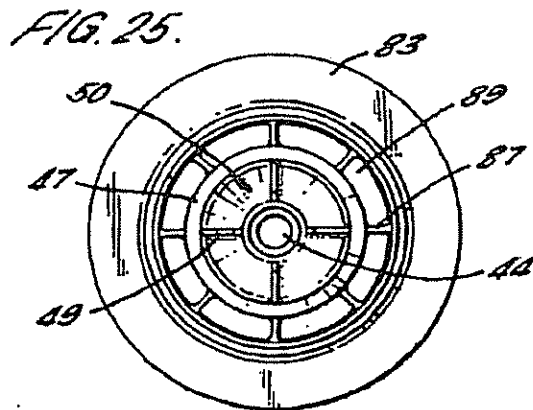
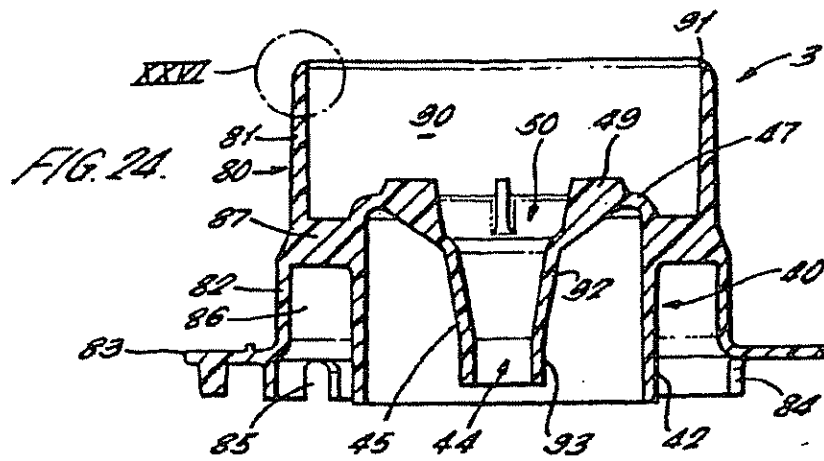
FIG. 20.



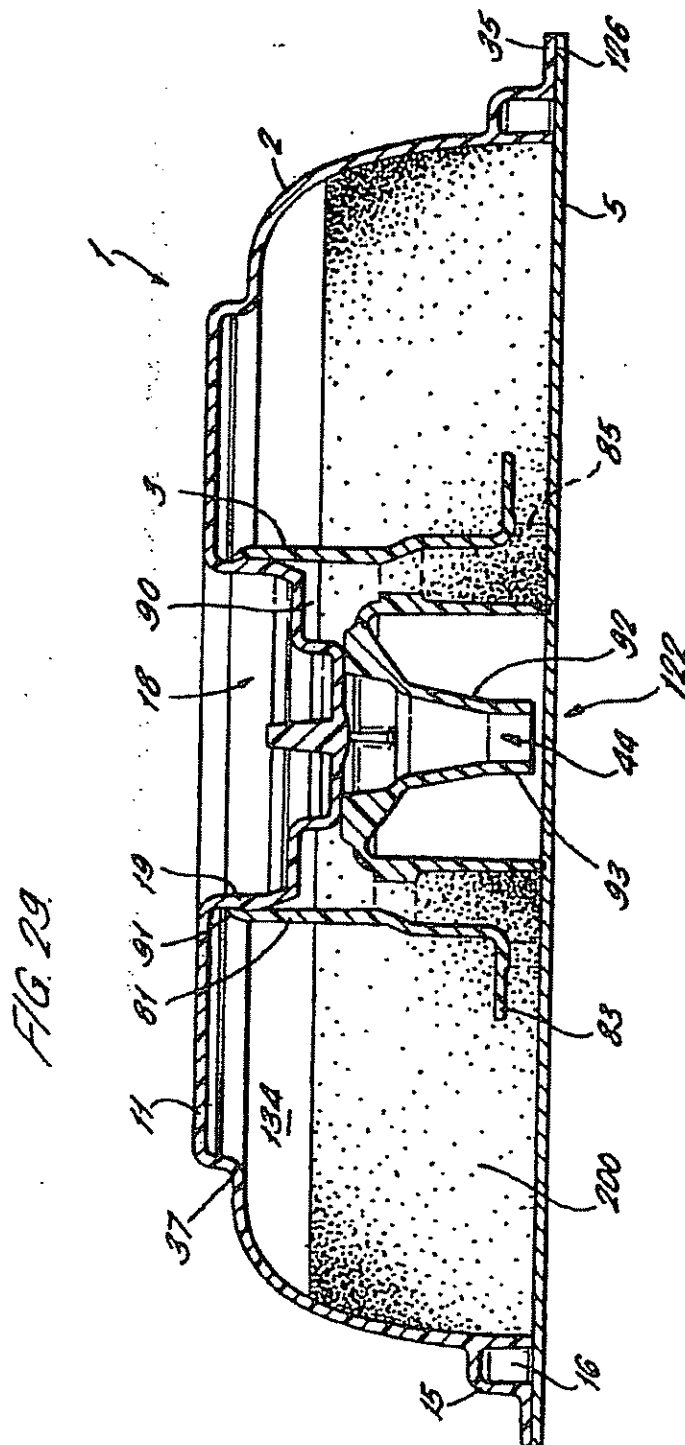
EP 1 440 913 B1



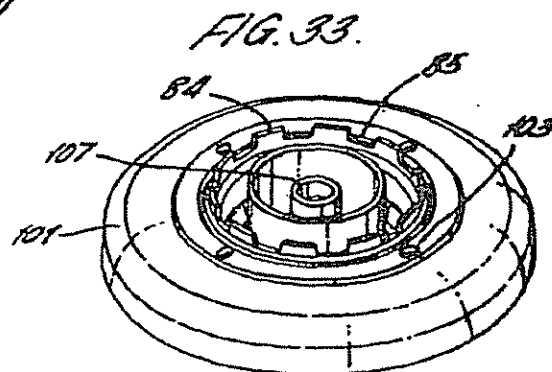
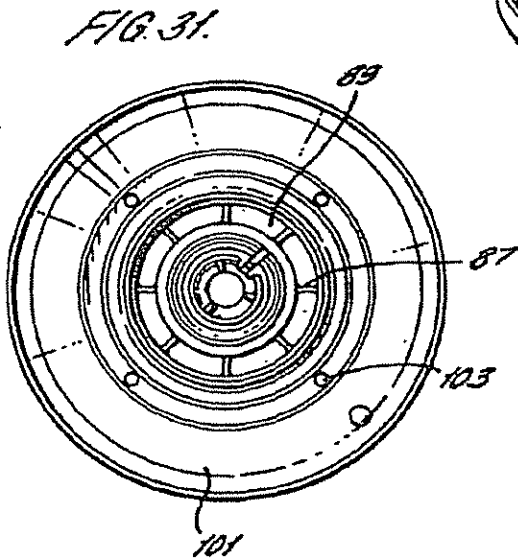
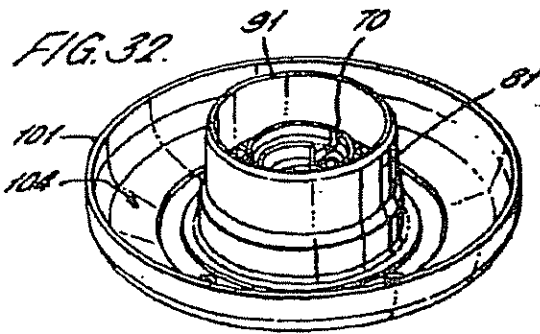
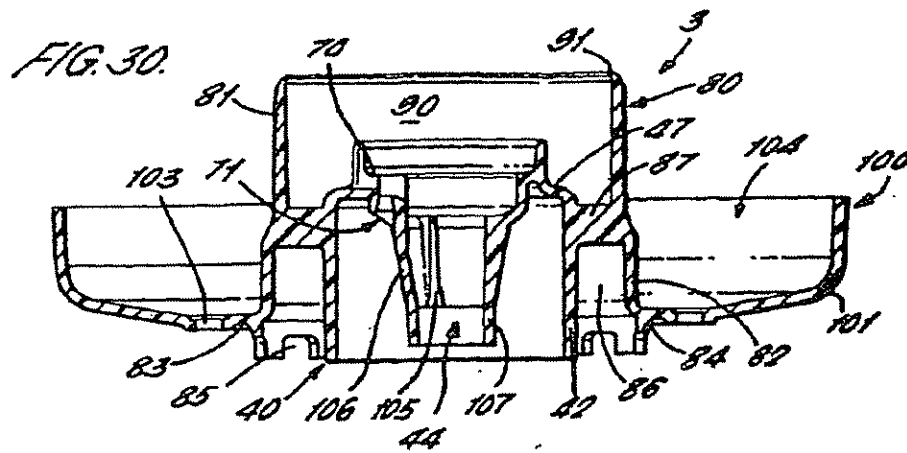
EP 1 440 913 B1



EP 1 440 913 B1

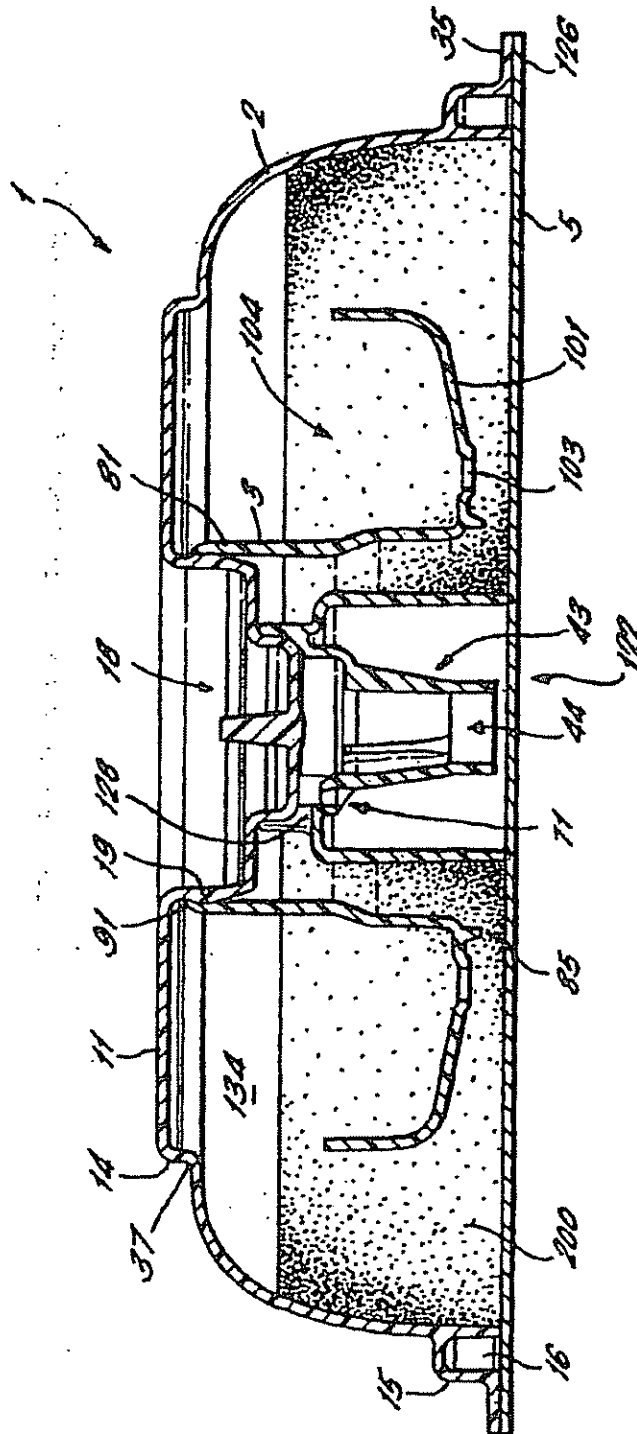


EP 1 440 913 B1

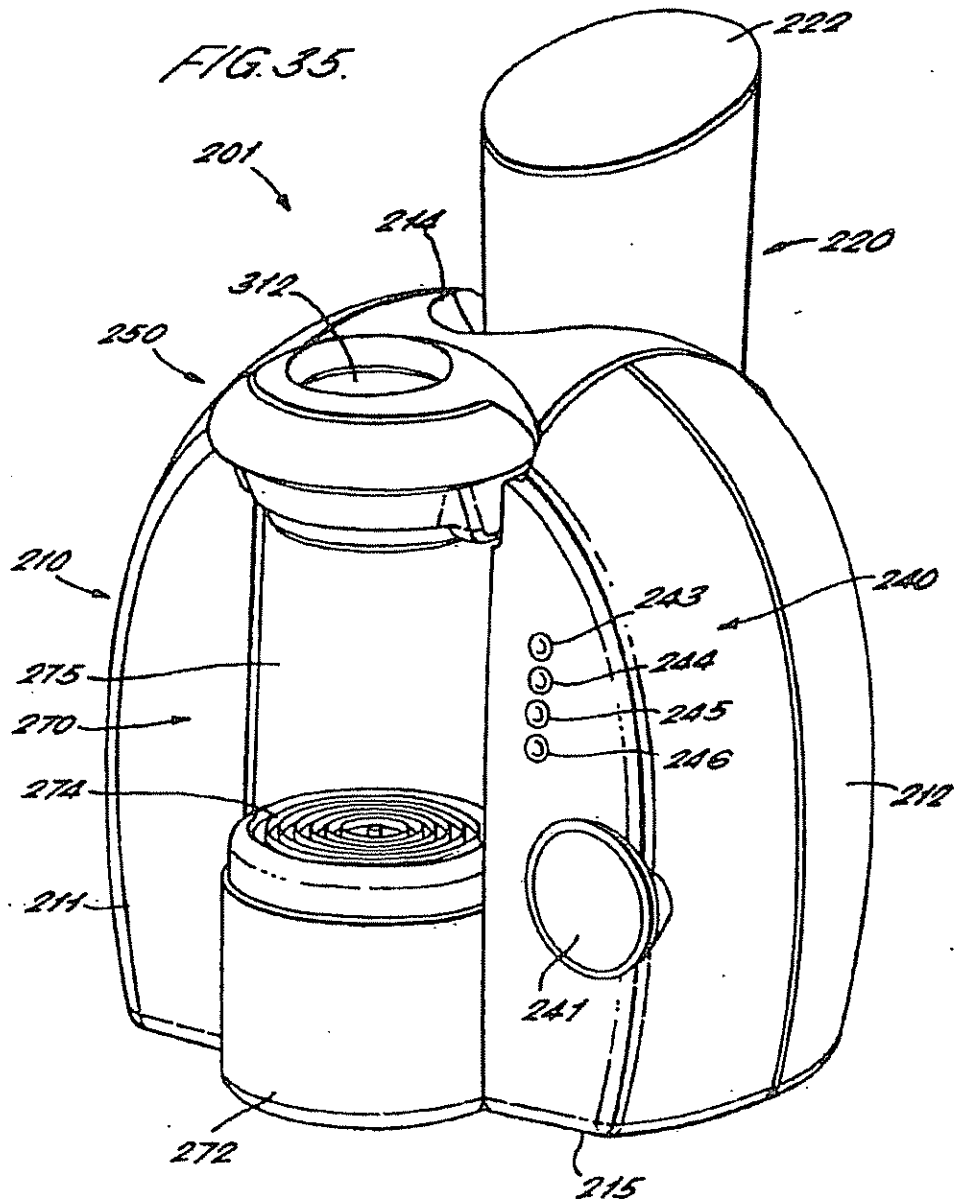


EP 1 440 913 B1

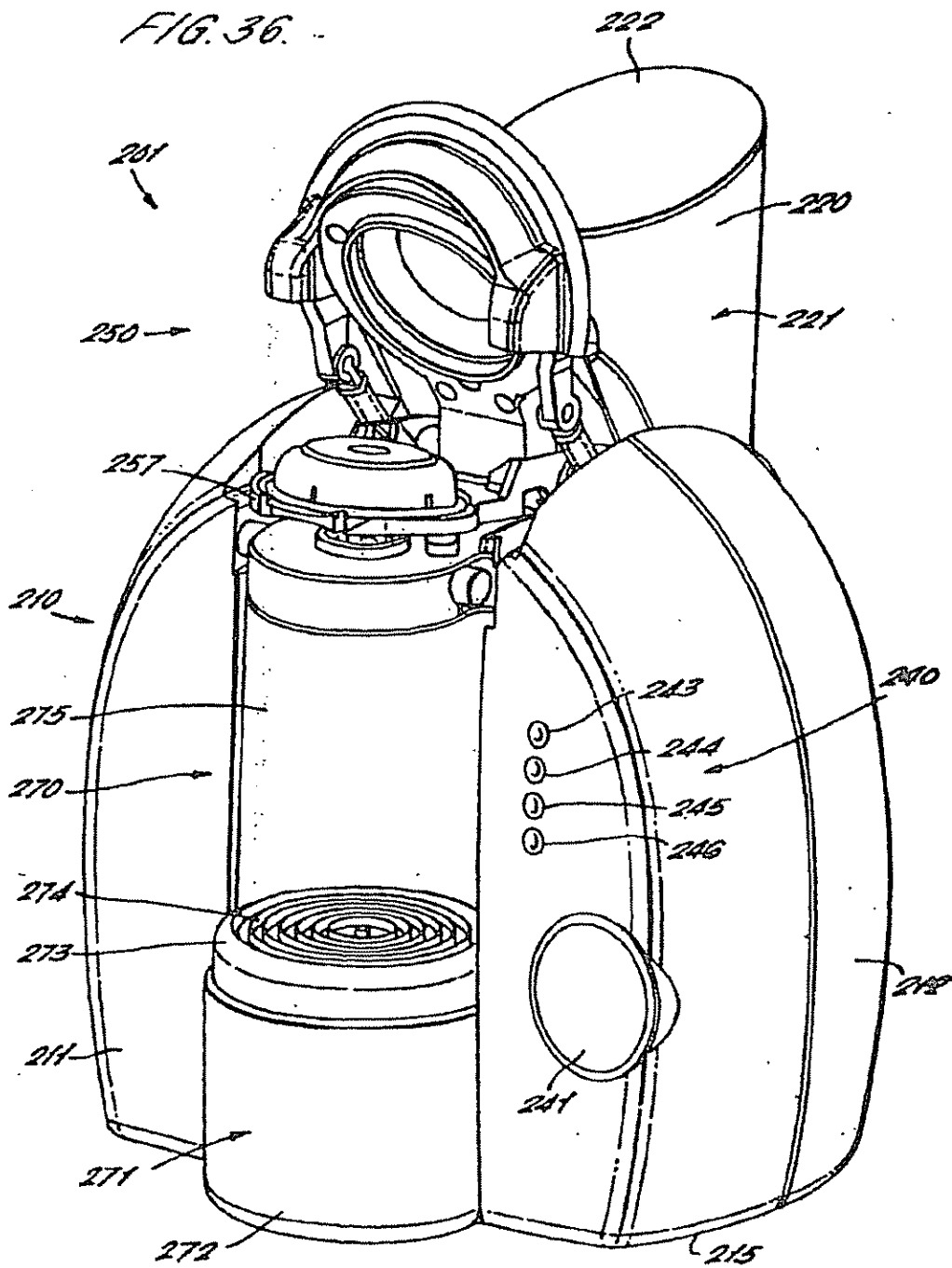
FIG. 3A



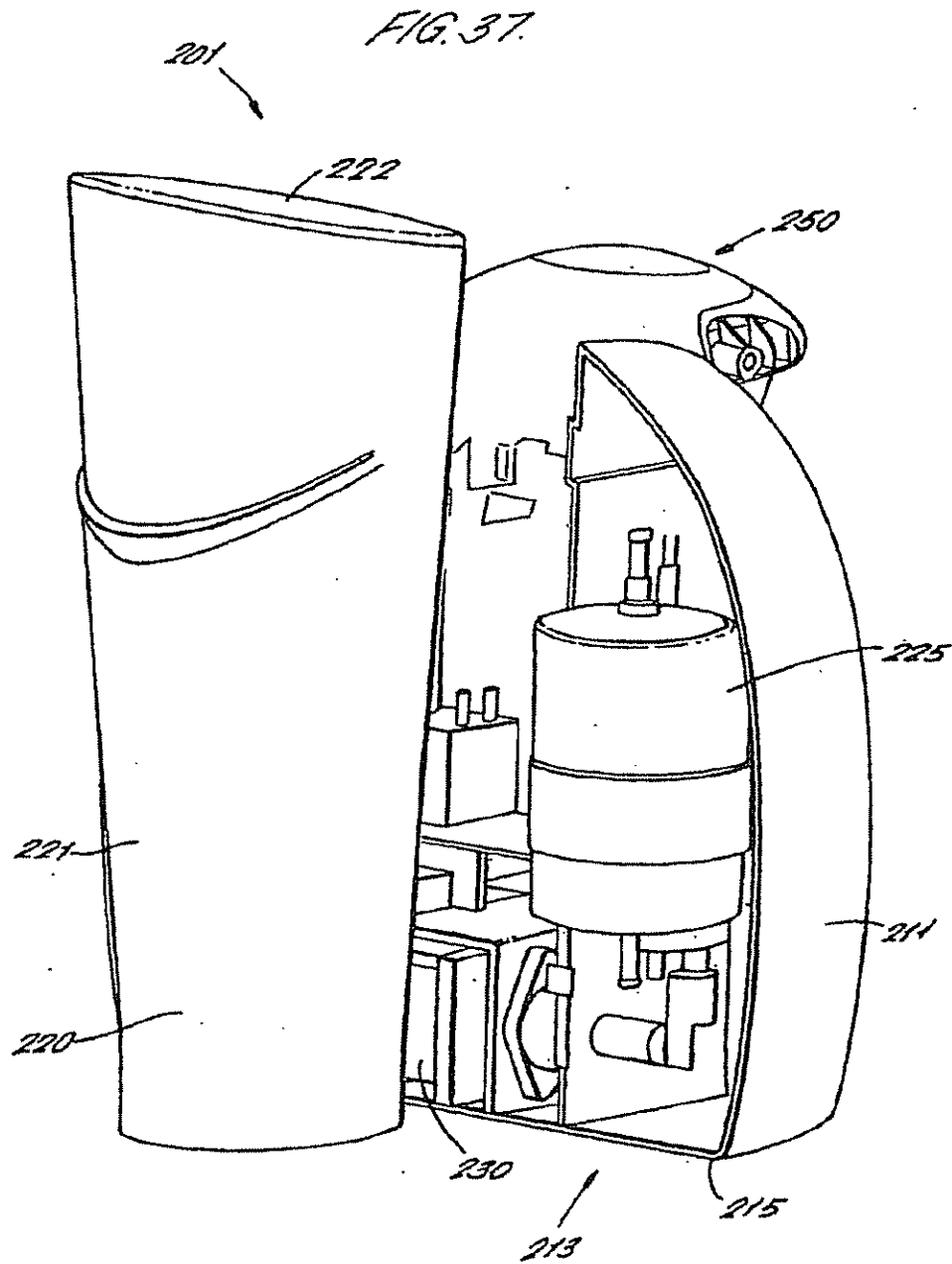
EP 1 440 913 B1



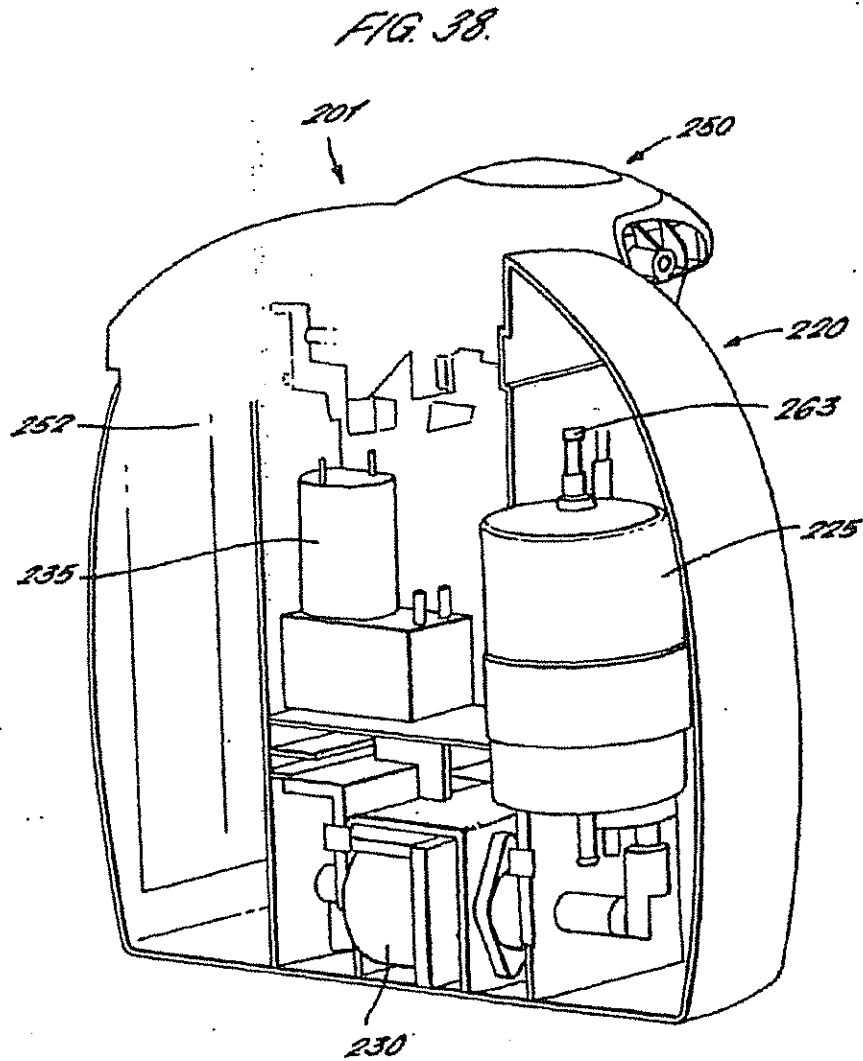
EP 1 440 913 B1



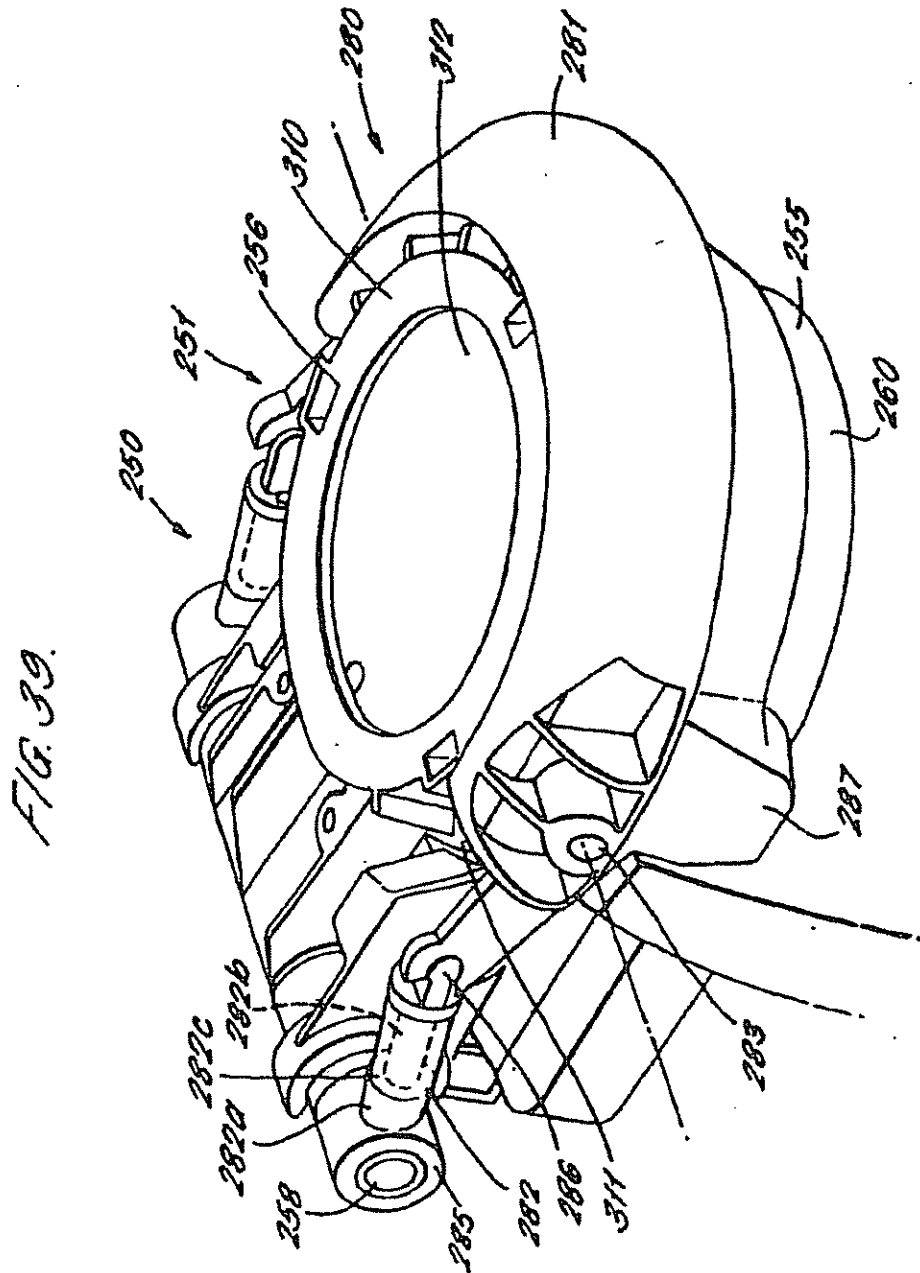
EP 1 440 913 B1



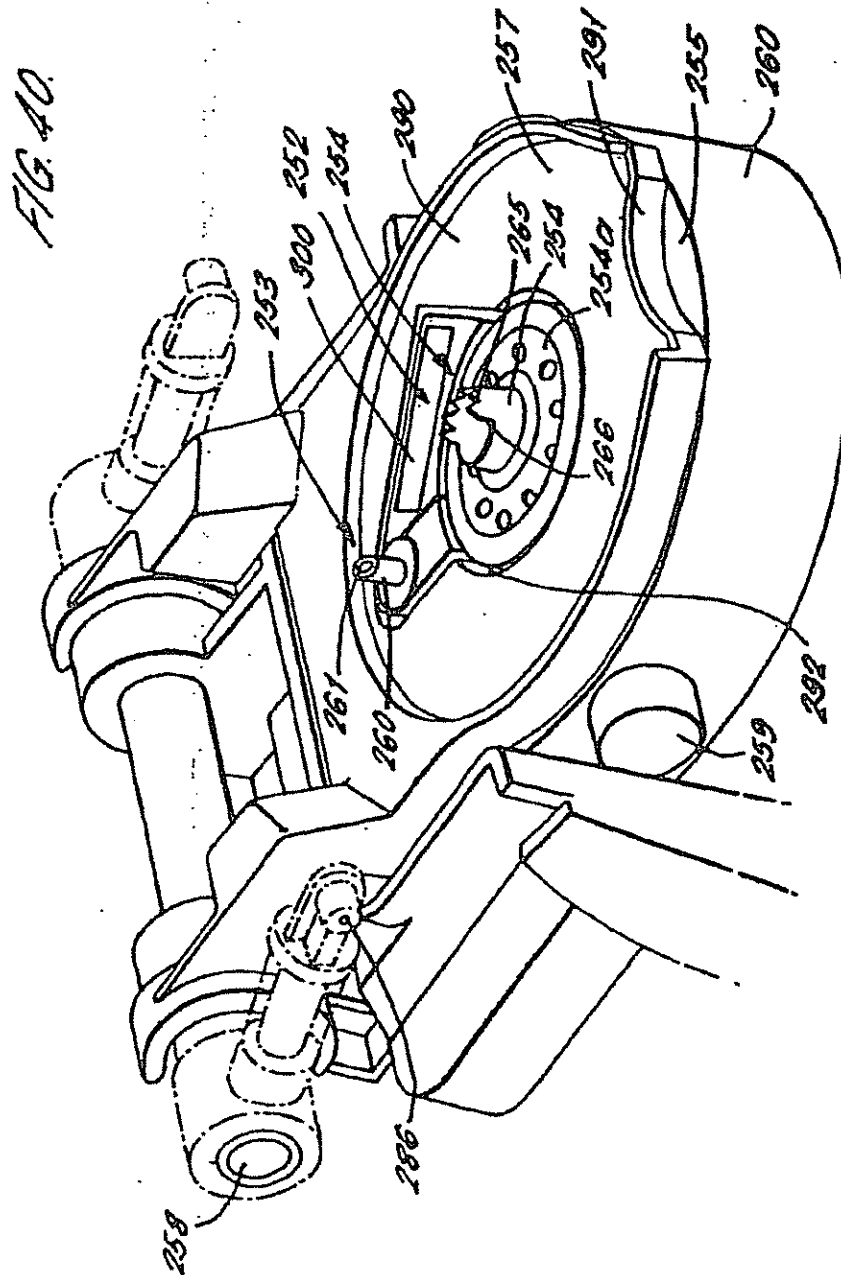
EP 1 440 913 B1



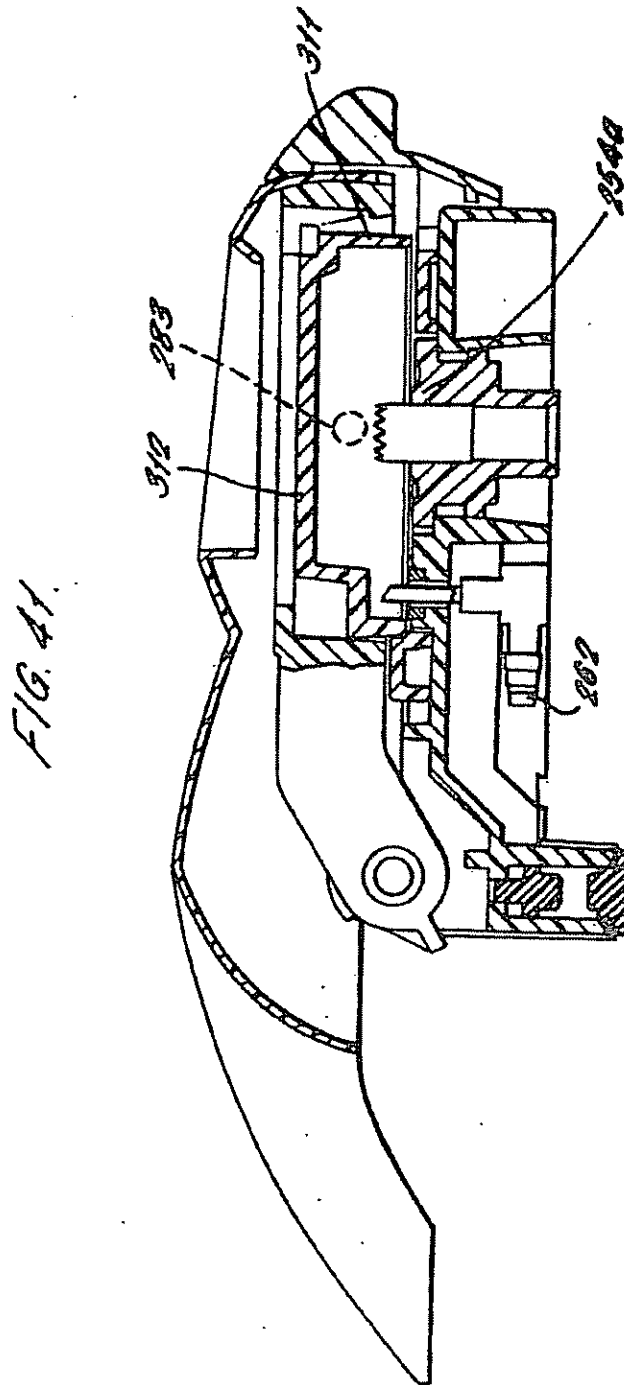
EP 1 440 913 B1



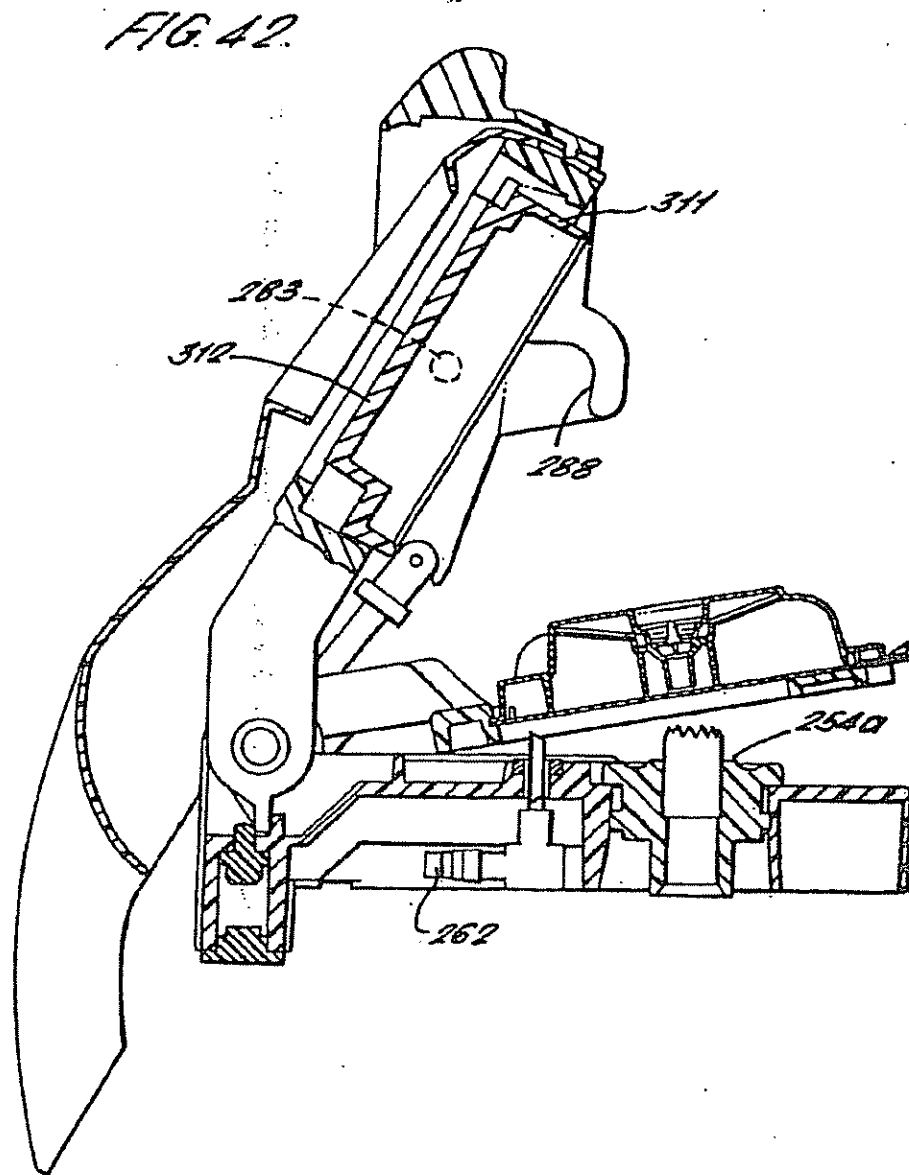
EP 1 440 913 B1



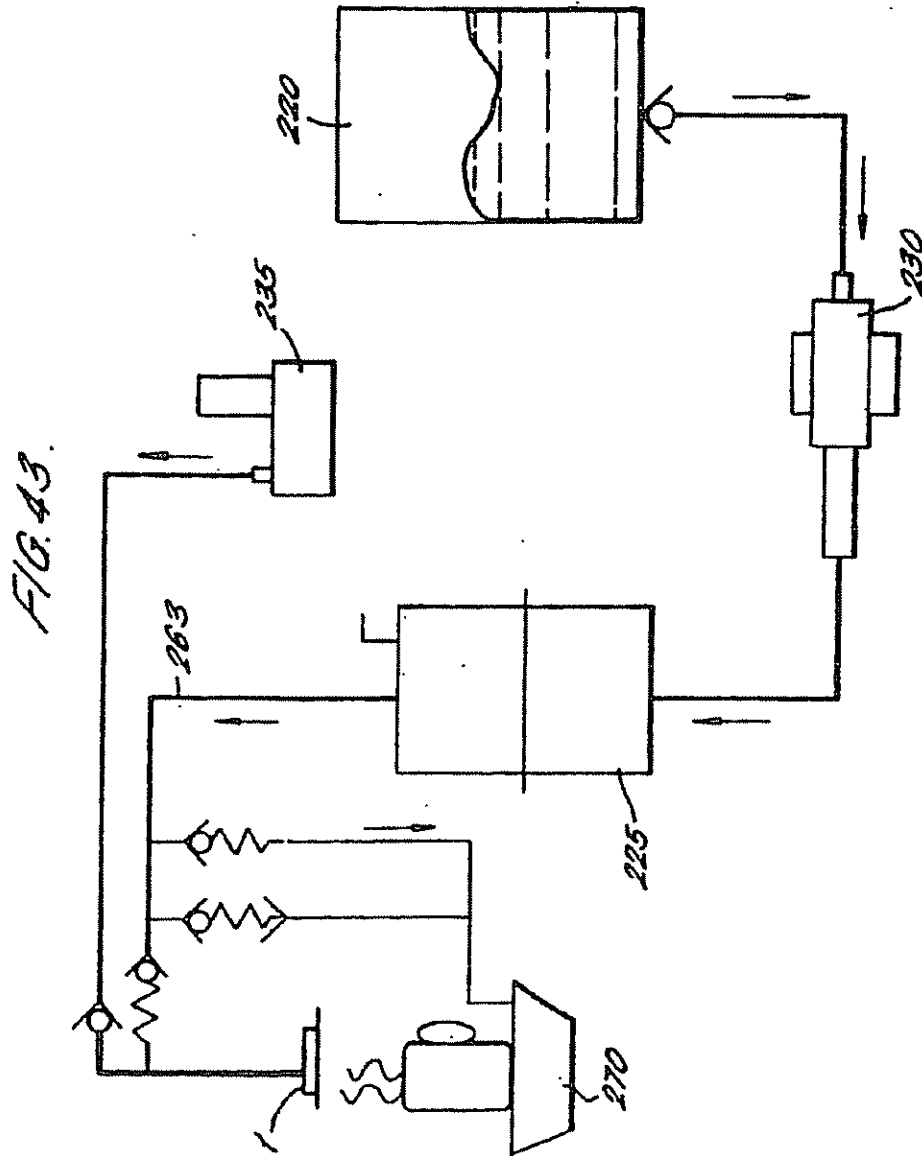
EP 1 440 913 B1



EP 1 440 913 B1



EP 1 440 913 B1



EP 1 440 913 B1

FIG. 44a.

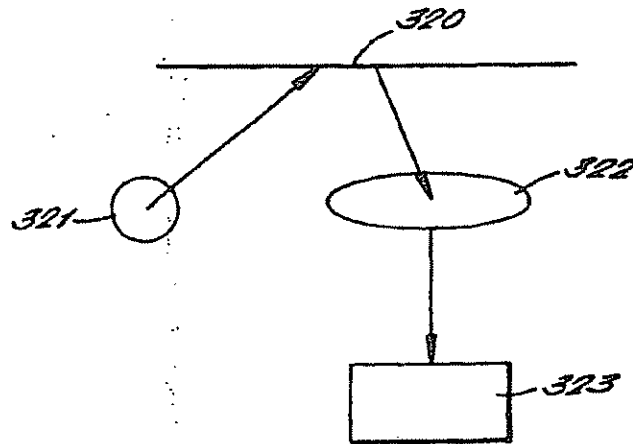
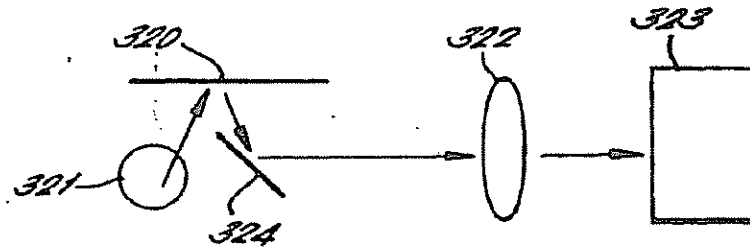
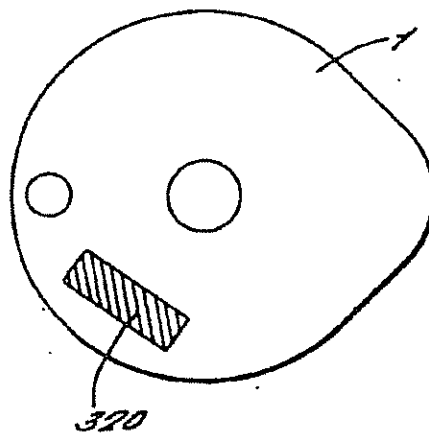


FIG. 44b.



EP 1 440 913 B1

FIG. 45.





EPAEPOOEB
D-80298 München
+49 89 2399-0
TX 523 656 epmu d
FAX +49 89 2399-4465

Europäisches
Patentamt

Generaldirektion 2

European
Patent Office

Directorate General 2

Office européen
des brevets

Direction Générale 2

Thomson, Neil David
Boulton Wade Tennant
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT
ROYAUME-UNI

Telephone numbers:

Primary Examiner +49 89 2399-2583
(substantive examination)

Formalities Officer / Assistant +49 89 2399-2569
(Formalities and other matters)



Application No. 04 250 384.7 - 2308	Ref. P62225EP00	Date 02.12.2004
Applicant Kraft Foods R&D, Inc.		

Communication pursuant to Article 96(2) EPC

The examination of the above-identified application has revealed that it does not meet the requirements of the European Patent Convention for the reasons enclosed herewith. If the deficiencies indicated are not rectified the application may be refused pursuant to Article 97(1) EPC.

You are invited to file your observations and insofar as the deficiencies are such as to be rectifiable, to correct the indicated deficiencies within a period

of 4 months

from the notification of this communication, this period being computed in accordance with Rules 78(2) and 83(2) and (4) EPC.


One set of amendments to the description, claims and drawings is to be filed within the said period on separate sheets (Rule 36(1) EPC).

Failure to comply with this invitation in due time will result in the application being deemed to be withdrawn (Article 96(3) EPC).



GRONDIN D D
Primary Examiner
for the Examining Division

Enclosure(s): 3 page/s reasons (Form 2906)

	Bescheld/Protokoll (Anlage)	Communication/Minutes (Annex)	Notification/Procès-verbal (Annexe)
	Datum Date Date	Blatt Sheet Feuille	Anmelde-Nr.: Application No.: Demande n°:
	02.12.2004	1	04 250 384.7

The examination is being carried out on the **following application documents**:

Description, pages:

1-61 as originally filed

Claims, No.:

1-29 as originally filed

Drawings, sheets:

1/24-24/24 as originally filed

1. The following documents are referred to in this communication:

D1: EP 0 272 922 A (GEN FOODS LTD) 29 June 1988

D2: EP 0 451 980 A (GEN FOODS KRAFT LTD) 16 October 1991

2. 1- The subject-matter of independent claim 1 is not new for the following reasons:
Document D1 discloses all the features of claim 1. In particular D1 shows a cartridge containing one or more beverage ingredients and being formed from substantially air- and water-impermeable materials, the cartridge defining a storage chamber (21) containing the beverage ingredients and a manifold chamber (27), the cartridge comprising an opening through which the ingredients can be filled into the storage chamber, the opening being closed by a lid (25) having a first portion overlying the manifold chamber (27) and a second portion overlying the storage chamber (21), wherein the first portion of the lid is pierceable to accommodate an inflow of an aqueous medium into the manifold chamber and the lid is pierceable to accommodate an outflow of beverage formed in the storage chamber (see col.7, l.60-col.8, l.40 and fig.4-6).

For the sake of completeness, the attention of the applicant is drawn to the fact that the document D2 discloses all the features of claim 1 as well: see col.5, l.38-col.6, l.35 and fig.1-5.



Bescheld/Protokoll (Anlage)

Communication/Minutes (Annex)

Notification/Procès-verbal (Annexe)

 Datum
 Date
 Date 02.12.2004

 Blatt
 Sheet
 Feuille 2

 Anmelde-Nr.:
 Application No.: 04 250 384.7
 Demande n°:

2- The subject-matter of independent claim 24 is not new as the method steps claimed would be obviously achieved for using the cartridge known from D1 or D2.


3- The subject-matter of independent claim 25 is not new for the following reasons: the documents D1 and D2 disclose all the features of claim 25 (see D1, col.7, l.60-col.8, l.40 and fig.4-6 and D2, col.5, l.38-col.6, l.35 and fig.1-5).

Therefore the present application does not meet the requirements of Article 52(1) EPC, because the subject-matter of the independent claims 1, 24 and 25 is not new in the sense of Article 54(1) and (2) EPC.

3. The additional features of the dependent claims 2 to 8, 11 to 18 and 20 to 22 respectively of the claims 26 to 29, in combination with the features of claim 1 respectively 25, cannot contribute to render the subject-matter claimed novel as they are also known from D1: see col.2, l.5-col.6, l.54; col.7, l.60-col.8, l.40 and fig.4-6.
Moreover, the additional features of the dependent claims 2 to 8, 13 to 17, 20 to 22 and 26 to 29 are also known from D2: see col.5, l.38-col.6, l.35 and fig.1-5.
4. The independent claim 23 is not clear (Article 84 EPC) as the expression "consistent within 1.0 standard deviations" has no common meaning.
5. Although claims 1 and 25 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought. The aforementioned claims therefore lack conciseness. Moreover, lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.

Hence, claims 1 and 25 do not meet the requirements of Article 84 EPC.

In order to overcome this objection, it would appear appropriate to file an amended set of claims defining the relevant subject-matter in terms of a single

	Bescheld/Protokoll (Anlage)		Communication/Minutes (Annex)		Notification/Procès-verbal (Annexe)	
	Datum Date Date	02.12.2004	Blatt Sheet Feuille	3	Anmelde-Nr.: Application No.: Demande n°	04 250 384.7

independent claim in each category followed by dependent claims covering features which are merely optional (Rules 29(3) and (4) EPC).

6. It is not at present apparent which part of the application could serve as a basis for a new, allowable claim.
- Should the applicant nevertheless regard some particular matter as patentable, an independent claim should be filed taking account of Rule 29(1) EPC. The applicant should also indicate in the letter of reply the difference of the subject-matter of the new claim vis-à-vis the state of the art and the significance thereof.

To meet the requirements of Rule 27(1)(b) EPC, at least the documents D1 and D2 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.

In order to facilitate the examination of the conformity of the amended application with the requirements of Article 123(2) EPC, the applicant is requested to clearly identify the amendments carried out, irrespective of whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based.

09/06 2005 15:50 FAX 02074307600

BOULT WADE TENNANT

001/009

**Boulton Wade Tennant**European Patent and Trade Mark Attorneys
Chartered Patent AttorneysVerulam Gardens
70 Gray's Inn Road
London WC1X 6BTTelephone
+44 (0)20 7430 7500Facsimile
+44 (0)20 7430 7600E-Mail boulton@boulton.com
Website www.boulton.comOffices in:
Reading, Oxford and CambridgeEUROPEAN PATENT OFFICE
Erhardtstrasse 27
D-80331 Munich
Germany

9 June 2005

BY FAX TO: 00 49 89 2399 4465
FROM: +44 20 7430 7600 - 9 Pages
CONFIRMATION BY COURIER

Dear Sirs,

European Patent Application No. 04250384.7
In the Name of KRAFT FOODS R&D, INC.
Our Ref: TBA/NDT/P62225EP00

I write in response to the Communication pursuant to Article 96(2) EPC issued on 2 December 2004 in connection with this application.

The Examiner has objected to the novelty of the independent claims based on the disclosures of EP0272922 (D1) and EP0451980 (D2).

The Examiner contends that the independent claims of the present application lack novelty over the disclosures of D1 or D2. Contrary to the Examiner's suggestion, it is submitted that the cartridges of D1 and D2 do not disclose a first portion of a lid which is pierceable in use to accommodate an inflow of an aqueous medium into a manifold chamber.

D1 and D2 disclose cartridges which are designed to have an inlet 26 which is formed through a rigid polypropylene body portion and not through the laminated foil lid 24, 25. It is a requirement of the independent claims of the present application that the cartridge and the lid are such that the lid is suitable for being pierced to accommodate an inflow of aqueous medium into the manifold chamber. This is not the case in the design of cartridge shown in D1 and D2. With reference in particular to Figure 5 of D1 it can be seen that the underside portion of the body 2 of the cartridge in the vicinity of the inlet 26 is not designed to make it suitable for the laminate in that region to be pierced to form an inlet. In particular, no suitable element is provided against which the inlet piercer on a beverage preparation machine may abut when the inlet is formed. As such, if the design of cartridge shown in D1 or D2 was pierced through the lid, a suitable inlet would not be formed since there would be a large degree of leakage from the underside of the cartridge. It is therefore submitted that D1 and D2 do not disclose cartridges which would be seen by the skilled person as having lids suitable for being pierced to form an inlet.

Partners
Geoffrey Baylis
Bruce Alexander
Rupert Cross
Teresa Dicks
Claire Baldock
Anthony Purvis
Nick Melzack
John Walker
Adrian Hayes
Sarah Merrifield
Martyn Draper
Alec Frost
Rohan Stone
Julius Stahl
Neil Thomson

Jonathan Palmer
Nina White

Senior Attorneys
Emma Petepher
Mohamed Daud
Hsu Min Chung
Emma Pitcher
Donald McRob

Nigel Tucker
Paul Hicks
Geoff Dallanore
Oliver Fingree
Felicity Hyde

Heather Ponsford
Stephen Ebbens
Sue Thomas

* List Name: Anthony Purvis

Empf.zeit: 09/06/2005 16:49

Empf.nr.: 225 P.001

09/06 2005 15:50 FAX 02074307600

BOULT WADE TENNANT

002/009

The European Patent Office

- 2 -

9 June 2005

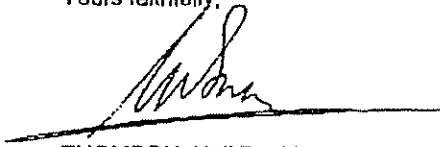
In Paragraph 4 the Examiner has objected that the expression "consistent within 1.0 standard deviations", has no common meaning. It is submitted that the use of this phrase in claim 23 is clear, in particular in light of the content of the description. Reference is directed in particular to the data contained in Tables 1 and 2 on pages 34 and 35 and the accompanying calculations. This passage of the description gives a clear indication of what the percentage of the yield of the beverage produced from the beverage ingredients means and a method for calculating the standard deviation of the yield.

In response to the objection in Paragraph 5, claims 25 to 29 have been deleted. These claims will be the subject of a divisional application in due course.

In response to the objection in Paragraph 6, D1 and D2 have been acknowledged on p1 of the description.

If the Examiner has any further objections to the claims of the present application I request the issuance of a further Examination Report or an opportunity to speak with the Examiner.

Yours faithfully,



THOMSON, Neil David
Authorised Representative
BOULT WADE TENNANT

Encs.

542560; NOT; CMV

Empf.zeit:09/06/2005 16:49

Empf.nr.:225 P.002

A117

09/08 2005 15:51 FAX 02074307600

BOULT WADE TENNANT

003/009

1

P62225EP

CARTRIDGE FOR THE PREPARATION OF BEVERAGES

The present invention relates to a cartridge for the preparation of beverages and, in particular, to sealed
5 cartridges which are formed from substantially air- and water-impermeable materials and which contain one or more ingredients for the preparation of beverages.

It has previously been proposed to seal beverage preparation ingredients in individual air-impermeable
10 packages. For example, cartridges or capsules containing compacted ground coffee are known for use in certain coffee preparation machines which are generally termed "espresso" machines. In the production of coffee using these preparation machines the coffee cartridge is placed in a
15 brewing chamber and hot water is passed through the cartridge at relatively high pressures, thereby extracting the aromatic coffee constituents from the ground coffee to produce the coffee beverage. Typically, such machines operate at a pressure of greater than 6×10^5 Pa. The
20 preparation machines of the type described have to date been relatively expensive since components of the machine, such as the water pumps and seals, must be able to withstand the high pressures.

EP0272922 and EP451980 described beverage cartridges
25 accordingly to the preamble of claim 1.

In WO01/58786 there is described a cartridge for the preparation of beverages which operates at a pressure generally in the range 0.7 to 2.0×10^5 Pa. However, the cartridge is designed for use in a beverage preparation
30 machine for the commercial or industrial market and is relatively expensive. Hence, there remains a requirement

09/06 2005 15:51 FAX 02074307600

BOULT WADE TENNANT

004/009

1A

for a cartridge for the preparation of beverages wherein the
cartridges and beverage preparation machine are suitable, in

Empf.zeit:09/06/2005 16:50

Empf.nr.:225 P.004

A119

09/06 2005 15:51 FAX 02074307600

BOULT WADE TERNANT

005/009

2

P62225EP

particular, for the domestic market in terms of cost, performance and reliability.

In typical known beverage cartridges the inlet and outlet of the beverage cartridges are formed on opposite
5 sides of the cartridge. This has the disadvantage that the beverage preparation machine used to dispense the cartridges normally requires a complicated mechanical arrangement for moving inlet and outlet piercers into engagement with the cartridge from opposite directions. In addition, the inlet
10 and outlet piercers can also impede access for inserting and withdrawing the beverage cartridge from the beverage preparation machine. In WO01/60220 a beverage cartridge is provided wherein the inlet and outlet are formed on the same side of the cartridge. However, this cartridge can be prone
15 to blockage of the inlet piercers since they contact directly the beverage ingredients.

Accordingly, the present invention provides a cartridge containing one or more beverage ingredients and being formed from substantially air- and water-impermeable materials, the
20 cartridge defining a storage chamber containing the one or more beverage ingredients and a manifold chamber, the cartridge comprising an opening through which the one or more beverage ingredients can be filled into the storage chamber, the opening being closed by a lid having a first
25 portion overlying the manifold chamber and a second portion overlying the storage chamber, characterised in that the first portion of the lid is pierceable in use to accommodate an inflow of an aqueous medium into the manifold chamber and the lid is pierceable in use to accommodate an outflow of
30 beverage formed from interaction of the aqueous medium and the one or more beverage ingredients in the storage chamber.

Empf.zeit:09/06/2005 16:50

Empf.nr.:225 P.005

A120

09/06 2005 15:51 FAX 02074307600

BOULT WADE TENNANT

006/009

6

P6222SEP

The present invention also provides a plurality of cartridges, each cartridge as above, wherein the percentage yield of the beverage produced from the one or more beverage ingredients contained in the cartridges is consistent to
5 within 1.0 standard deviations.

The present invention also provides a method of use of a cartridge as described above wherein the cartridge is displaced relative to one or more static piercing elements in order to form the inlet to, and outlet from, the
10 cartridge. This is advantageous in that a simplified piercing mechanism may be utilised which is not required to be articulated or otherwise moved. In addition, since the piercing elements are static a more precise alignment of the cartridge and the piercing elements may be achieved
15 resulting in improved performance and less splashing of the aqueous medium, particularly at the outflow.

Empf.zeit:09/06/2005 16:50

Empf.nr.:225 P.006

A121

09/08 2005 15:51 FAX 02074307600

BOULT WADE TENNANT

007/009

7

P62225EP

In the following description the terms "upper" and "lower" and equivalents will be used to describe the relational positioning of features of the invention. The terms "upper" and "lower" and equivalents should be understood to refer to the cartridge (or other components) in its normal orientation for insertion into a beverage preparation machine and subsequent dispensing as shown, for example, in Figure 4. In particular, "upper" and "lower" refer, respectively, to relative positions nearer or further from a top surface 11 of the cartridge. In addition, the terms "inner" and "outer" and equivalents will be used to describe the relational positioning of features of the invention. The terms "inner" and "outer" and equivalents should be understood to refer to relative positions in the cartridge (or other components) being, respectively, nearer or further from a centre or major axis X of the cartridge 1 (or other component).

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

09/08 2005 15:52 FAX 02074307600

BOULT WADE TENNANT

008/009

62

P62225EP

Claims:

1. A cartridge (1) containing one or more beverage ingredients (200) and being formed from substantially
5 air- and water-impermeable materials, the cartridge defining a storage chamber (130; 134) containing the one or more beverage ingredients and a manifold chamber (16), the cartridge comprising an opening (12) through
10 which the one or more beverage ingredients can be filled into the storage chamber, the opening being closed by a lid (5) having a first portion overlying the manifold chamber and a second portion overlying the storage chamber, characterised in that the first
15 portion of the lid is pierceable in use to accommodate an inflow of an aqueous medium into the manifold chamber and the lid is pierceable in use to accommodate an outflow of beverage formed from interaction of the aqueous medium and the one or more beverage ingredients in the storage chamber.
- 20
2. A cartridge (1) as claimed in claim 1 further comprising a discharge chamber which is overlain by a third portion of the lid (5) which is pierceable in use
25 to accommodate the outflow of beverage formed from interaction of the aqueous medium and the one or more beverage ingredients in the storage chamber.
3. A cartridge (1) as claimed in claim 2 wherein the
30 discharge chamber comprises a discharge spout (43).

09/06 2005 15:52 FAX 02074307600

BOULT WADE TENNANT

003/009

66

P62225EP

beverage ingredients (200) contained in the cartridges
is consistent to within 1.0 standard deviations.

24. A method of use of a cartridge as claimed in any
5 preceding claim wherein the cartridge is displaced
relative to one or more static piercing elements in
order to form the inlet to, and outlet from, the
cartridge.

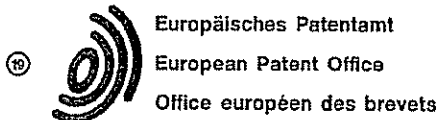
Empf.zeit:09/06/2005 16:51

Empf.nr.:225 P.009

A124

PART

3 of 3



(11) Publication number:

**0 272 922
A2**

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 87311325.2

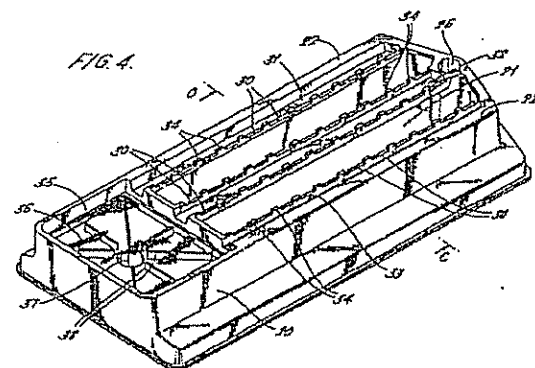
(51) Int. Cl.⁴: **B 65 D 81/34**

(22) Date of filing: 22.12.87

(20) Priority: 23.12.86 GB 8630757

(43) Date of publication of application:
29.06.88 Bulletin 88/26(64) Designated Contracting States:
BE CH DE ES FR GB IT LI NL SE(71) Applicant: **GENERAL FOODS LIMITED**
Banbury Oxfordshire, OX16 7QU (GB)(72) Inventor: **Bentley, Andrew Charles**
26 Nuffield Drive
Banbury Oxon OX16 7BX (GB)**King, Christine Ann**
7 Horton Drive
Middleton Cheney Banbury, Oxon, OX16 2LP (GB)**MacMahon, Alistair John**
12 Westminster Croft
Brackley Northants, NN13 5ED (GB)**Newman, Alec Thomas**
Greenways, Warmington
Banbury, Oxon, OX17 1BU (GB)**Tansley, Robert William**
The Elms Tiddington Road Tiddington
Stratford-upon-Avon Warwickshire (GB)(74) Representative: **Allard, Susan Joyce et al**
BOULT, WADE & TENNANT 27 Fumival Street
London EC4A 1PQ (GB)(54) **Beverage packages.**

(57) A sealed beverage package containing one or more beverage ingredients and being formed from substantially air- and water-impermeable materials, the said package comprising a body portion having a compartment containing the beverage ingredients and a beverage outlet channel formed therein, the beverage outlet channel and the compartment of the body portion containing the beverage ingredients communicating in such a manner that, in use, the said compartment and the outlet channel co-operate to act as a filter during the preparation of a beverage from the package.



Bundesdruckerei Berlin

EP 0 272 922 A2

1

O 272 922

2

Description

BEVERAGE PACKAGES

The present invention relates to beverage packages and, in particular, to sealed beverage packages which are formed from a substantially air- and water-impermeable material and which contain one or more beverage ingredients.

The production of freshly brewed tea or coffee involves contacting tea leaves or roast and ground coffee with hot water and separating the beverage from the tea leaves or coffee grounds. Various methods for the production of freshly brewed coffee or tea are well known. For example, tea is prepared traditionally in a teapot, the tea leaves being immersed in boiling water and allowed to stand before being poured from the pot. Freshly brewed coffee may be prepared by the continuous passage of hot water through roast and ground coffee contained in a filter and the coffee collected in a jug or other receptacle, or by percolation which involves the continuous recycling of water through the roast and ground coffee.

It has previously been proposed to seal fresh roast and ground coffee or tea leaves in individual air-impermeable packages. For example, cartridges or capsules containing compacted ground coffee are known for use in certain coffee making machines which are generally termed "espresso" machines. In the production of coffee using these coffee machines the coffee cartridge is placed in a brewing chamber and hot water is generally caused to pass under pressure through the cartridge, thereby extracting the aromatic coffee constituents from the ground coffee and producing a coffee beverage.

Cartridges containing roast and ground coffee in which hot water flows under gravimetric force through the cartridge are also known. A cartridge of this general type is described in British Patent No. 1397116.

The cartridges for use in "espresso" machines and those through which water flows under gravimetric force contain a filter positioned beneath the charge of coffee. In the production of coffee from these cartridges water is generally injected into the coffee containing cartridge through a needle. The cartridge is filled with water which flows through the filter and is collected in a cup or other receptacle.

We have now developed a sealed beverage package containing one or more beverage ingredients which does not require the charge of the beverage ingredients to be placed above a conventional filter.

Accordingly, the present invention provides a sealed beverage package containing one or more beverage ingredients and being formed from substantially air- and water-impermeable materials, the said package comprising a body portion having a compartment containing the beverage ingredients and a beverage outlet channel formed therein, the beverage outlet channel and the compartment of the body portion containing the beverage ingredients communicating in such a manner that, in use, the said compartment and the beverage outlet channel

co-operate to act as a filter during the preparation of a beverage from the package.

The body portion of the package of the invention may be provided with an inlet or an inlet may be formed in the package during use. In the embodiment where the inlet is formed in the body portion one or more inlet channels will preferably be provided which communicate with the inlet nozzle and with the compartment containing the beverage ingredients and assist in the distribution of water through the said compartment.

The body portion of the beverage package is preferably made from a rigid plastics material, such as polypropylene. The body portion may be coated with a thin layer of a barrier material, if desired, in order to improve the shelf life of the package.

The beverage package may be formed with a body portion which also acts as the bottom of the package. Alternatively, the body portion may be of an essentially hollow construction in which case the beverage package will have a flexible bottom portion sealed to the body portion adjacent the periphery of the bottom thereof.

Preferably the top portion of the package is made from a flexible material such as aluminium foil or a laminated material, such as a laminate comprising a metal layer laminated to a barrier layer of a plastics material. Many laminates of this type are known in the art and an example thereof is a polyester/aluminium/polypropylene laminate. The optional bottom portion of the beverage package may also be formed from a material of this type.

In one embodiment of the invention the beverage outlet channel is provided in a flange which forms part of the body portion. It is preferred, in this embodiment of the invention, that the flange provided in the body portion should totally surround the compartment containing the beverage ingredients, although it is contemplated that this will not always be necessary. Furthermore, it is also preferred that the beverage outlet channel should extend in the flange around the whole of the periphery of the compartment containing the beverage ingredients. However, the present invention also includes within its scope beverage packages in which the beverage outlet channel extends in the flange only along a part of the periphery of the compartment containing the beverage ingredients. For example, if the beverage package is of elongate form then the beverage outlet channel may extend along the length of one long edge only.

In other embodiment of the invention a beverage outlet channel is formed along at least a part of the periphery of the compartment containing the beverage ingredients. For a package which is of elongate form a beverage outlet channel may be formed along one or both longitudinal edges of the compartment containing the beverage ingredients. Alternatively, or in addition, a beverage outlet channel may span the compartment containing the beverage ingredients.

The beverage package of the invention may be of any desired shape, although essentially round, rectangular or square packages are preferred. In an embodiment of the invention the package of the present invention preferably has an area which is adapted, when in use, to form an outlet for the beverage from the package. Alternatively, the body portion of the package may also have an outlet formed therein which communicates with the beverage outlet channel. The outlet of the package may be designed to be opened, in use, by the user for example, by means of tear strings, tear strips or peelable tabs. Alternatively, the package of the present invention may be designed for use with a machine in which the outlet of the package is opened automatically by cutting or piercing, or by the pressure of the water introduced into the package and from which the beverage is made. In the embodiment of the invention in which the package has a region which is intended, in use, to form an outlet for the beverage from the package a V-shape channel may be formed which communicates with the beverage outlet channel so that the beverage is funnelled into a narrow stream for collection in an appropriate cup or other receptacle.

The beverage outlet channel formed in the body portion and the compartment containing the beverage ingredients communicate in such a manner that, in use, the compartment and the beverage outlet channel co-operate to act as a filter during the preparation of a beverage from the package. This can be achieved in a variety of ways. For example, when the beverage outlet channel is formed in a flange which surrounds or at least partially surrounds the compartment containing the beverage ingredients, then the top portion of the package may be sealed not only to the body portion adjacent the periphery of the flange, but also at various points along the edge of the outlet channel which communicates with the said compartment. Similarly, when the beverage outlet channel is formed along at least a part of the periphery of the compartment containing the beverage ingredients, the top portion of the package may be sealed to the body portion not only adjacent the periphery thereof, but also at various points along the edge of the outlet channel which communicates with the said compartment, for example by making appropriate spot welds of the top portion of the package package to this edge. The seals along the edge of the outlet channel may be formed by providing castellations in the edge to which the top portion can readily be sealed. In this manner, a plurality of very narrow channels or slots are provided connecting the compartment containing the beverage ingredients to the beverage outlet channel, thereby acting as a filter. It will be understood that the channels or slots should be of a size such that the majority of the roast and ground coffee particles are retained in the coffee bed. This will generally be achieved with castellations 0.2 to 0.5 millimetres high, depending upon the particular particle size of the coffee contained in the beverage package.

Alternatively, the dimensions of the various parts of the device may be so chosen that the top portion

is sealed across the body portion in a relatively taut manner so that only a very narrow passageway remains connecting the compartment containing the beverage ingredients to the beverage outlet channel, thus acting as a filter.

When the body portion also acts as the bottom of the package it may be desirable to form one or more channels in the base of the compartment containing the beverage ingredients, in order to assist in the even distribution of the water used to make the beverage. Baffles may also be incorporated into the compartment containing the beverage ingredients, for example to prevent undue movement of insoluble beverage ingredients such as tea leaves therein, or to improve the water distribution for soluble powdered materials so that they dissolve more readily.

The beverage package of the present invention is designed, as discussed above, in order to incorporate a primary filter therein. This primary filter acts to retain at least the majority of any particles of insoluble beverage ingredients in the compartment containing the said ingredients. However, it may be desirable also to incorporate a secondary filter into the beverage package. In particular, when the beverage package contains leaf tea it may be difficult to prevent leaves of tea from escaping from the beverage compartment through the primary filter. Similarly, using a secondary filter for the preparation of coffee from roast and ground coffee enables any fine coffee particles which have passed through the primary filter to be collected and this results in coffee of less turbidity which may be preferred by the consumer.

A secondary filter may be positioned between the compartment containing the beverage ingredients and the beverage outlet channel, or immediately above the outlet from the package. The secondary filter may be formed from any conventional filter sheet material such as cellulose, a spun-bonded polypropylene or a random weave polyester.

It is believed that a beverage package containing both a primary and secondary filter is novel and, accordingly, in a further aspect the present invention provides a sealed beverage package containing one or more beverage ingredients and being formed from substantially air- and water-impermeable materials, which package incorporates therein a primary filter which is formed by the particular mode of construction of the package and a secondary filter. The secondary filter is preferably formed from a conventional filter material.

When the beverage package contains roast and ground coffee, it may also be desirable to provide a layer of roast and ground coffee particles at the top of the compartment of such a size that they are too large to escape from the compartment into the filter channel. In this aspect of the invention it is preferred that this upper layer of coffee particles has a particle size in the range of from 100 micrometres to 1 millimetre.

The remainder of the package may be filled with a lower layer of ground coffee adjacent the first layer. The lower layer preferably has a particle size such that 98% by weight of the ground coffee passes a 75 micrometre mesh. The particles of the upper layer

act essentially as a filter and prevent the very small particles of the lower layer of coffee from escaping from the package.

The roast and ground coffee of the upper layer is prepared by the dry grinding of roasted coffee beans to relatively coarse grounds which is a well known operation in the coffee industry.

The particle size distribution of the coffee particles of the lower layer of the coffee is preferably 99.9% less than 100 micrometres, 98% less than 75 micrometres, 95% less than 60 micrometres, 90% less than 45 micrometres and 50% less than 20 micrometres.

It will be understood that the variety or blend of coffee beans which are fine ground to produce the coffee particles of the lower layer need not be the same as the variety or blend of coffee beans ground to produce the upper layer of coffee particles.

The package of the present invention, when filled with roast and ground coffee, preferably contains from 5 to 10 grams of roast and ground coffee, preferably about 7 grams for the preparation of a single cup. However, packages which are intended to provide multiple servings of coffee will contain an appropriate amount of roast and ground coffee, for example, packages intended to provide say five cups of coffee will contain from 20 to 50 grams of roast and ground coffee, preferably about 30 grams.

It will be understood that the very fine particles of ground coffee, which may be contained in a package in accordance with the present invention which contains roast and ground coffee, enable an improved extraction (i.e. higher yields) of the aromatic coffee constituents to be obtained from the roast and ground coffee. Alternatively, it is possible using a package of the present invention filled with roast and ground coffee as discussed above to reach a desired level of extraction of aromatic coffee constituents from the package in a shorter period of time.

The packages of the present invention are preferably flushed with an inert gas, such as nitrogen, prior to sealing and this ensures a long shelf life for the contents of the package.

The package may contain any desired beverage ingredients, for example, roast and ground coffee, leaf tea, chocolate powder and, according to individual taste, powdered milk or creamer, sugar and/or an artificial sweetener. Alternatively, the package may contain liquid beverage ingredients for one preparation of hot or cold beverages, for example a syrup concentrate from the preparation of a carbonated cold beverage therefrom.

It will be understood that it may be convenient for the compartment containing the beverage ingredients to be separated into two or more sections, for example, one section containing roast and ground coffee and another section containing powdered milk or creamer.

The present invention also includes within its scope a method for preparing a beverage which comprises positioning a sealed beverage package as described above at a brewing station, injecting water through water introduction means into the package, allowing the water to filter through the

beverage ingredients contained in the package, allowing the beverage so-formed to filter into the beverage outlet channel and collecting the beverage so-formed through an outlet formed in the package.

The water is preferably injected into the beverage package under pressure, for example at a pressure of up to 150 psi (1034 KPa). For the preparation of hot beverages the water which is used for injection may either be boiling or may be at a temperature substantially below boiling and then be heated up during the beverage preparation, for example by means of a heating element. For the preparation of cold beverages, the water which is used for injection will be cold or chilled. It is also contemplated that the package of the invention could contain ingredients for the preparation of carbonated beverages and in this case carbonated water will be injected into the package.

The water under pressure may be injected into the beverage package through an inlet formed in the package or through a slot of an appropriate size and shape formed, in use, in the base of the compartment containing the beverage ingredients. For example, a cruciform cut may be made in the base and water forced under pressure through the cut into the beverage package. The water injection may then be followed by compressed air in order to force the water through the package. It may also be convenient to be able to regulate the amount of water injected into the package so that a smaller quantity of a stronger beverage can be produced. For example it would be possible to inject a quantity of water sufficient for a half or whole cup of coffee, as desired. It may also be desirable to brew a small amount of a stronger beverage and then dilute this with a separate supply of water since this will avoid all of the volume of water having to pass through the package. To prepare a cup of coffee from a beverage package of the invention containing roast and ground coffee will take about 15 seconds and this is a very acceptable brewing time for the consumer.

It is also contemplated that a plurality of packages may be connected together in the form of a strip. In this embodiment of the invention the packages would preferably be attached to one another at the ends thereof. It will be understood that a line of weakness may be incorporated between adjacent packages during the manufacture thereof, this making the separation of individual packages from a strip a relatively easy matter. Furthermore, if desired several strips of the packages may be joined together along the longitudinal edges thereof to form a block of packages from which individual packages may be removed as desired.

The filled beverage package of the present invention, and the preparation of a beverage therefrom, will be further described by way of example and with reference to the accompanying drawings, in which:-

Figure 1 is a top plan partially broken away view of a package in accordance with the invention;

Figure 2 is a section through the package of Figure 1 taken along the line A-A;

Figure 3 is a section along the line A-A of

Figure 1 showing the manner in which a beverage is prepared therefrom;

Figure 4 is a perspective view of the topside of the body portion of another package in accordance with the invention;

Figure 5 is a perspective view of the underside of the body portion of Figure 4; and

Figure 6 is a section taken along the line C-C of Figure 4 of a capsule incorporating the body portion of Figure 4.

Referring to the drawings, a package 1 comprises a body portion 2 formed from rigid polypropylene and a top portion 3 which is formed from a laminated material. The body portion 2 has a compartment 4 which contains the beverage ingredients therein, in the embodiment as shown the beverage ingredient being roast and ground coffee particles. The compartment 4 is also provided with a recess 5 which is adapted for the injection of water under pressure therethrough. The body portion has a flange 6 formed around the compartment 4, the flange having a beverage outlet channel 7 formed therein. As best shown in Figure 1, the top portion 3 is sealed to the body portion 2 around the periphery of flange 6, as shown generally at 8. The top portion is also sealed along rib 9 formed in the flange and to the crenellations 10 which are formed along the edges of the beverage outlet channel 7 which communicates with compartment 4. Slots 11 are thus formed by the space between the top portion 2 and the edge of the beverage outlet channel 7.

The package as shown is also provided with an essentially V-shaped channel 12 which assists in collecting liquid during the preparation of the beverage. The V-shaped channel is formed in tab 14 which is, essentially, a triangular extension of the flange 6.

In the preparation of a beverage from the package of the invention reference should be made to Figure 3 in which the arrows marked on the drawing indicate the route which the water will take during passage through the bed of roast and ground coffee. Water is injected under pressure through recess 5 in the direction of arrow B through a cut or injection hole in the recess (not shown). The water under pressure contacts the roast and ground coffee and a coffee infusion is made therefrom. The coffee beverage then passes through slots 11 into the beverage outlet channel 7. The pressure of the beverage builds up in the beverage outlet channel and causes the seal formed between the top portion 3 and rib 9 to break. The beverage thus flows over rib 9 into the collection channel 12 which funnel the beverage to form a stream thereof which can be readily collected in a cup or other receptacle. It will be appreciated that at least the uppermost layer of the roast and ground coffee particles are of a size such that they cannot ingress through slots 11 into the beverage outlet channel 7.

Figures 4, 5 and 6 illustrate an alternative embodiment of the package of the invention. Referring to these drawings, a body portion 20 is formed from a rigid plastics material such as polypropylene. The body portion comprises a compartment 21 which contains the beverage ingre-

dients, for example roast and ground coffee particles (not shown). The body portion 20 has an upper edge 22 as shown in Figure 4 and a lower edge 23 as shown in Figure 5. In use a laminated foil is sealed both along the upper edge 22 of the body portion and the lower edge 23 of the body portion. The upper and lower laminated foils 24 and 25, respectively, are shown in Figure 6. The body portion 20 is provided with an inlet 26 through which water is injected under pressure. The water passes via inlet 26 to an inlet channel 27 as is best shown in Figure 5. The water passes through the slots 28 formed in the side wall of channel 27 into the bed 21 of roast and ground coffee. The slots 28 are separated one from another by castellations 29 which are also sealed to the lower foil 25. The water passes through the bed of beverage ingredients contained in compartment 21 and then filters through the slots 30 which are formed at the edge of the beverage outlet channels 31, 32 and 33, respectively. The slots 30 are separated one from another by castellations 34 which are sealed to the upper foil 24. A satisfactory primary filtration of roast and ground coffee particles having a mean particle size of 350 micrometres can be obtained when the slots 30 are separated by castellations 34 approximately 0.3 millimetres high.

The path of flow of the water through the package is illustrated in Figure 6 by means of the arrows as shown on the drawing.

The beverage is collected via the beverage outlet channels 31, 32 and 33 via a collection chamber 35 which has a secondary filter 36 positioned above an outlet 37. The collection chamber 35 is strengthened by a plurality of ribs 38 positioned beneath filter 36 as shown in Figure 4. The outlet 37 is separated from the beverage compartment 21 by means of a transverse wall 39. The outlet may also be strengthened by means of flanges 40 attached thereto which serve to space the outlet 37 from the wall 39 and the edge 41 of body portion 20.

It will be appreciated that in use the package shown in Figures 1 to 3 of the drawings will be positioned vertically and when used in this manner the tab 14 which has the V-shaped channel 12 formed therein will be lowermost. The water, preferably just below boiling point and preferably under pressure will be injected into compartment 4 horizontally through recess 5.

In the embodiment as shown in Figures 1 to 3 of the drawings the outlet from the package is formed by the rupture of the seal between the top portion 3 and rib 9. It will be appreciated, however, that in other embodiments of the invention the outlet could be formed by cutting or piercing the package either manually or automatically in an appropriately designed vending machine.

The shape of the package as shown in Figures 1 to 3 of the drawings is of particular advantage for use in an automatic vending machine since the tab portion 14 makes it easy to locate the package in an appropriate housing provided in the machine.

The package as shown in Figures 4 to 6 of the drawings is designed to be used horizontally and, when used in this manner, the outlet 37 will project downwards so that the beverage prepared may be

9

0 272 922

10

collected in a cup or other receptacle.

It is also possible to inject different volumes of water into the package and this is of particular importance in relation to the preparation of coffee from roast and ground coffee particles. Thus it is possible to inject a small volume of water into the package containing roast and ground coffee in order to prepare an "espresso" cup of coffee, or alternatively to inject a larger quantity of water into the package containing roast and ground coffee and thus to prepare a standard cup of coffee. It will also be appreciated that packages can be produced which contain sufficient roast and ground coffee for the preparation of a larger quantity of coffee, for example several cups and is of particular importance in the catering trade.

Claims

1. A sealed beverage package containing one or more beverage ingredients and being formed from substantially air- and water-impermeable materials, the said package comprising a body portion having a compartment containing the beverage ingredients and a beverage outlet channel formed therein, the beverage outlet channel and the compartment of the body portion containing the beverage ingredients communicating in such a manner that, in use, the said compartment and the outlet channel co-operate to act as a filter during the preparation of a beverage from the package.

2. A beverage package as claimed in claim 1 wherein the body portion is made from a rigid plastics material.

3. A beverage package as claimed in claim 1 or claim 2 wherein the top portion is made from a flexible material, preferably aluminium foil or a laminated material.

4. A beverage package as claimed in any one of the preceding claims wherein the beverage outlet channel is formed along at least a part of the periphery of the compartment containing the beverage ingredients.

5. A beverage package as claimed in claim 4 wherein the body portion is of elongate construction and beverage outlet channels are formed along one or both longitudinal edges of the compartment containing the beverage ingredients.

6. A package as claimed in any one of the preceding claims wherein the top portion is sealed both to the body portion adjacent the periphery thereof and also at various points along the edge of the beverage outlet channel which communicates with the compartment containing the beverage ingredients.

7. A package as claimed in claim 6 wherein the edge of the beverage outlet channel which communicates with the compartment containing the beverage ingredients has a plurality of castellations formed therein onto which the top portion is sealed.

8. A package as claimed in any one of the preceding claims wherein the compartment for the beverage ingredients comprises an upper layer of roast and ground coffee particles having a particle size in the range of from 100 micrometres to 1 millimetre and a lower layer of roast and ground coffee particles having a particle size such that 98% by weight of the coffee passes a 75 micrometre mesh.

9. A package as claimed in any one of the preceding claims which is sealed under an inert gas.

10. A package as claimed in any one of the preceding claims wherein the compartment containing the beverage ingredients also has one or more channels formed therein to assist in the even distribution of water through the package.

11. A package as claimed in any one of the preceding claims wherein the body portion is provided with an inlet for water.

12. A package as claimed in claim 11 wherein the inlet communicates with the compartment containing the beverage ingredients by means of one or more inlet channels.

13. A package as claimed in any one of the preceding claims wherein the body portion is provided with an outlet for the beverage.

14. A package as claimed in claim 13 wherein the outlet communicates with the beverage outlet channel or channels.

15. A package as claimed in any one of the preceding claims which incorporates a secondary filter therein.

16. A package as claimed in claim 15 when dependent upon claim 13 wherein the secondary filter is positioned above the outlet formed in the body portion.

17. A sealed beverage package containing one or more beverage ingredients and being formed from substantially air- and water-impermeable materials, which package incorporates therein a primary filter which is formed by the particular mode of construction of the package and a secondary filter.

18. A package as claimed in claim 17 wherein the secondary filter is formed from a conventional filter material.

19. A plurality of packages as claimed in any one of the preceding claims which are connected together to form a strip.

20. A method for preparing a beverage which comprises positioning a sealed beverage package as claimed in any one of claims 1 to 14 at a brewing station, injecting water through water introduction means into the package, allowing the water to filter through the beverage ingredients contained in the package, allowing the beverage so-formed to filter into the beverage outlet channel and collecting the beverage so formed through an outlet formed in the package.

21. A method as claimed in claim 20 wherein the water is introduced into the package under a pressure of up to 150 psi.

11

0 272 922

12

22. A method as claimed in claim 21 wherein the water under pressure causes a part of the seal between the top portion and base portion to rupture, thus forming an outlet in the package.

5

23. A method as claimed in any one of claims 20 to 22 wherein the water is introduced into the package through an inlet formed therein.

24. A method as claimed in any one of claims 20 to 23 wherein the water injection is followed by the injection of compressed air into the package.

10

15

20

25

30

35

40

45

50

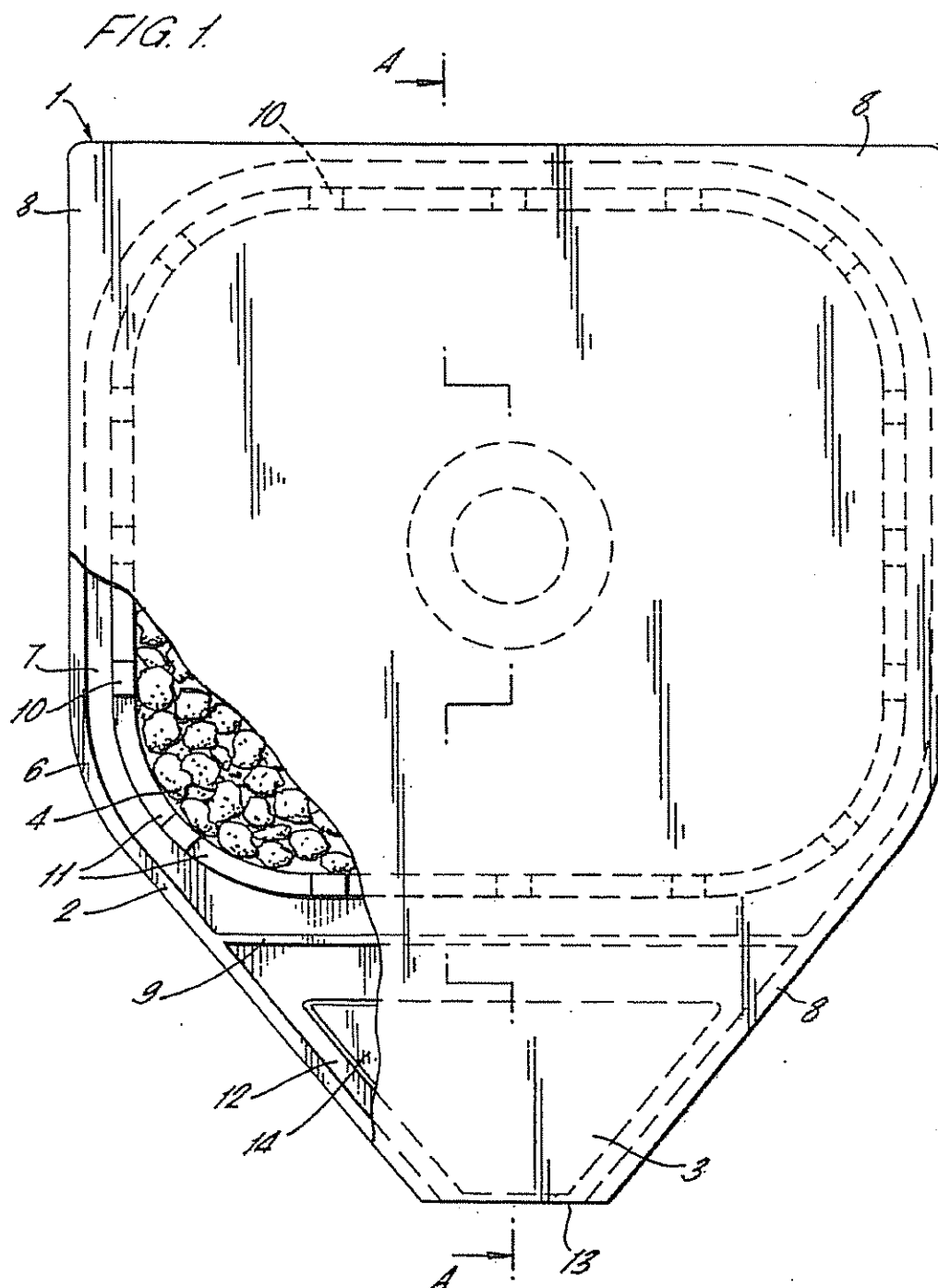
55

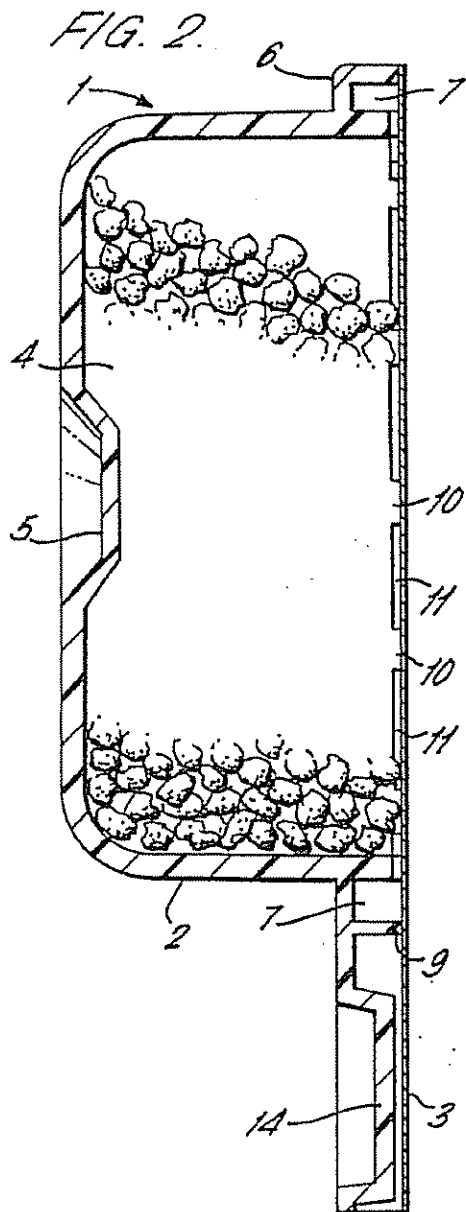
60

65

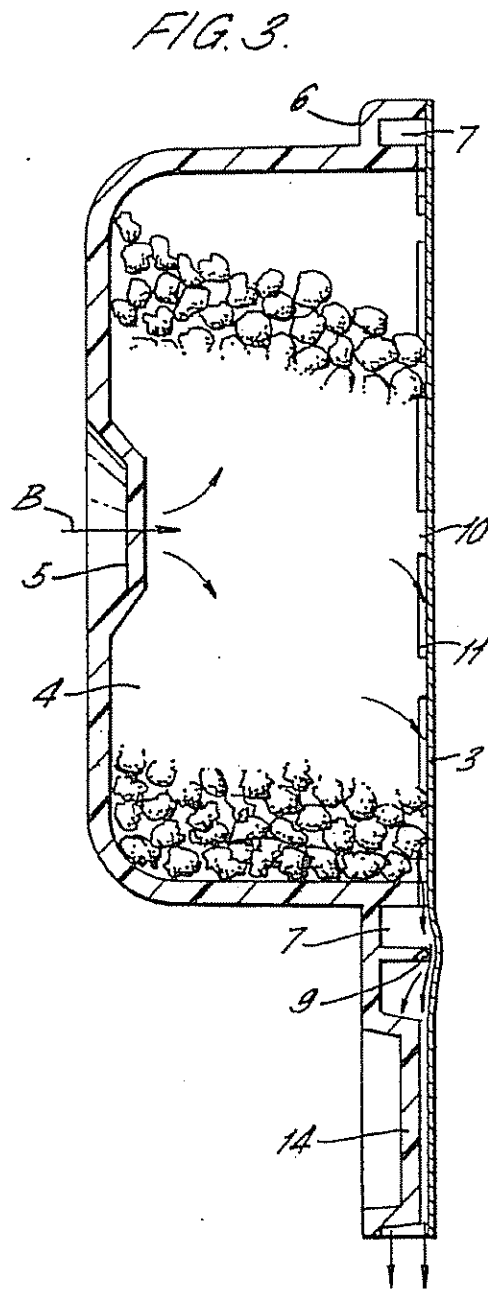
7

0272922

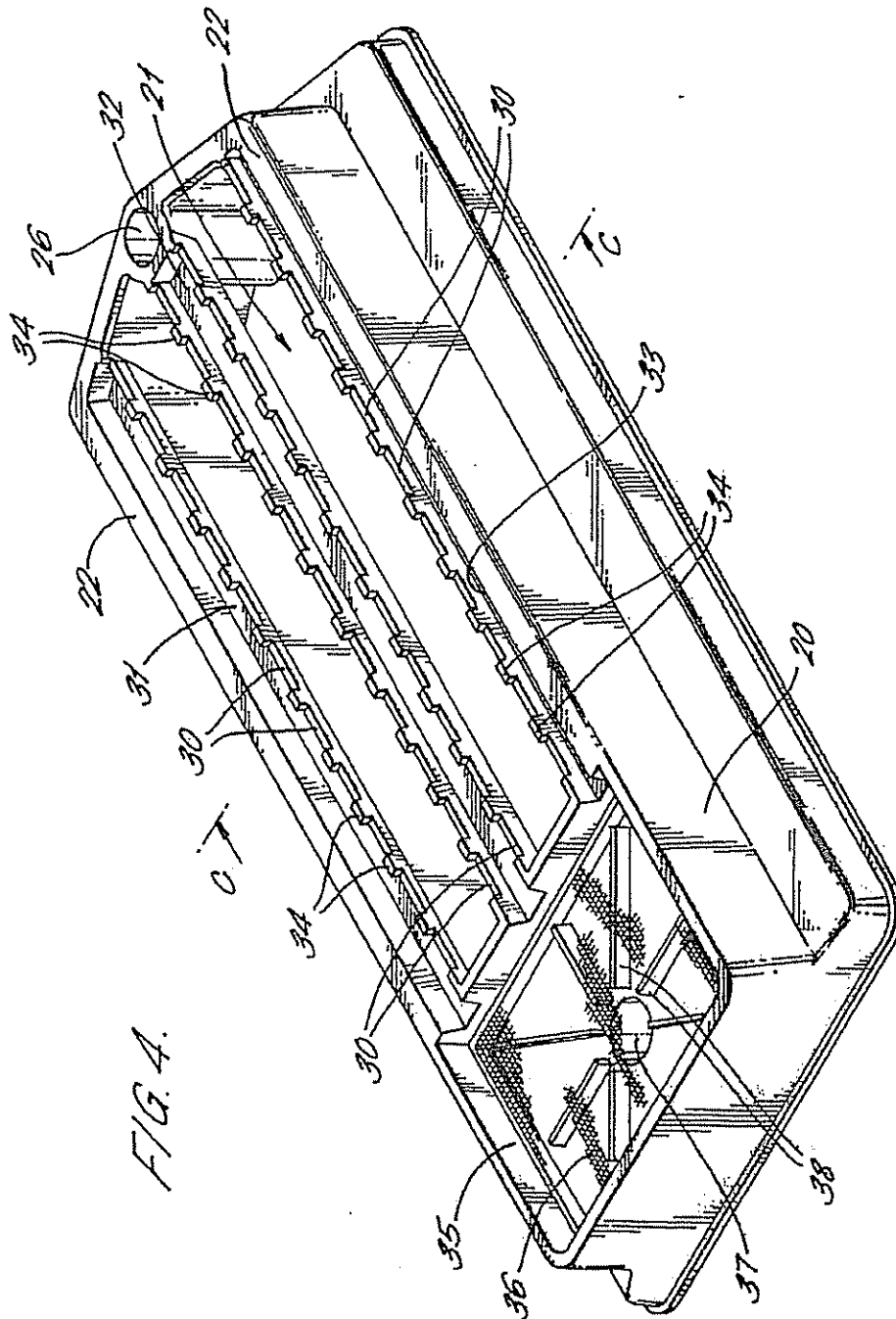




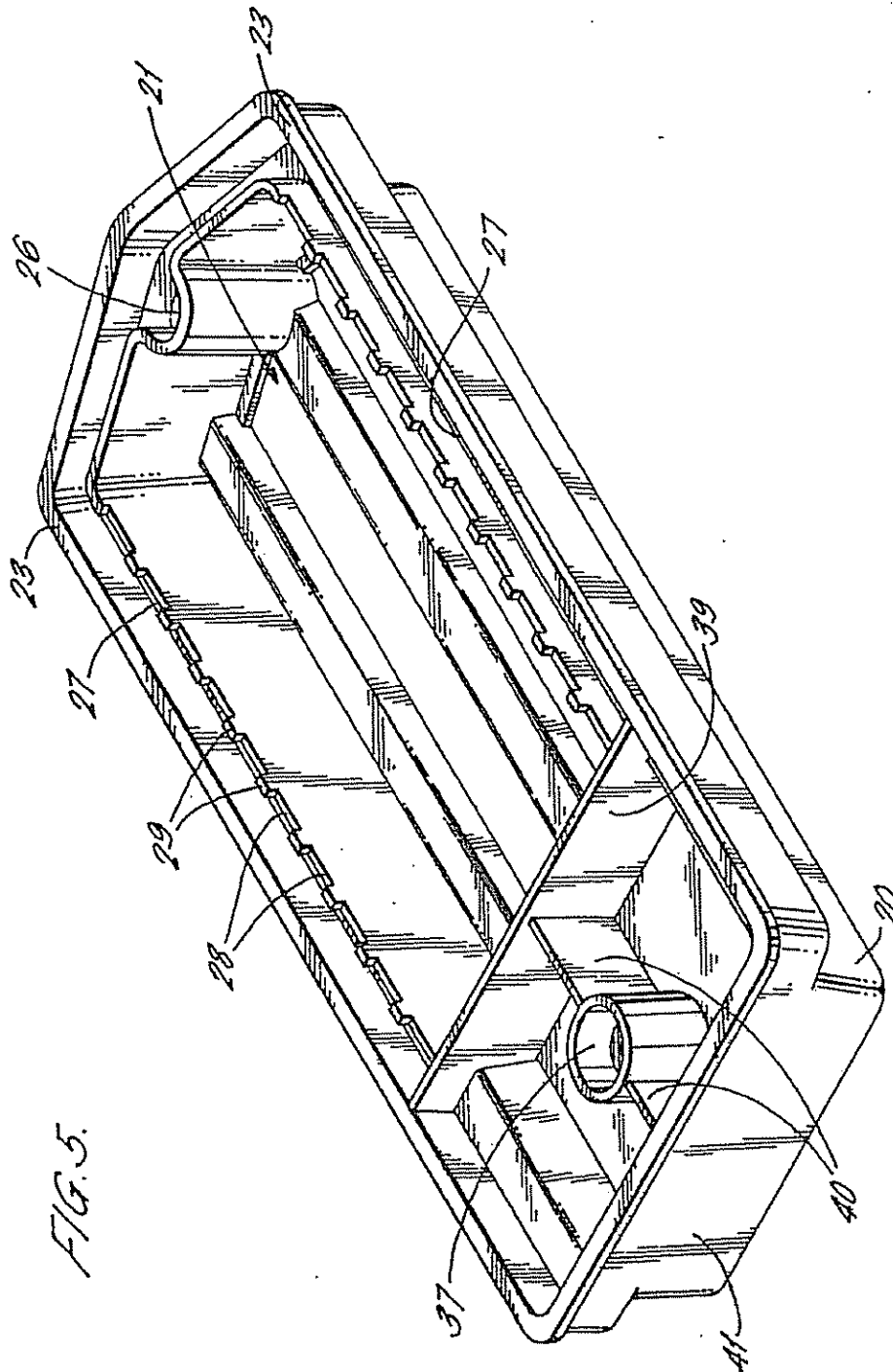
0272922



0272922

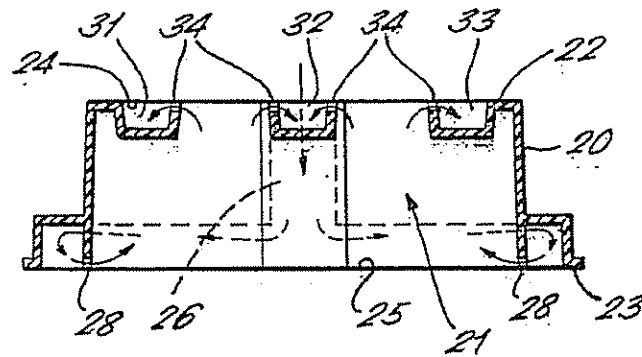


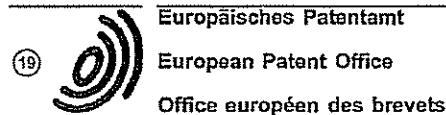
0272922



0272922

FIG. 6.





(11) Publication number: **0 451 980 A2**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: 91302535.9

(51) Int. Cl.⁵: **B65D 81/34**

(22) Date of filing: 22.03.91

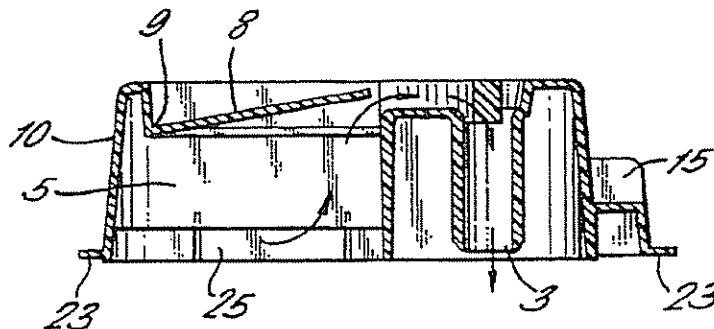
- (30) Priority: 30.03.90 GB 9007132
- (43) Date of publication of application:
16.10.91 Bulletin 91/42
- (84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE
- (71) Applicant: **KRAFT GENERAL FOODS LIMITED**
St. George's House, Bayshill Road
Cheltenham, Glos, GL50 3AE (GB)
- (72) Inventor: Tansley, Robert William
The Elms, Tiddington Road
Tiddington, Stratford, Warks (GB)
Inventor: Gibbs, Andrew
16 Dale Street
Leamington Spa Warks, CV32 5HJ (GB)

- Inventor: MacMahon, Alistair John
12 Westminster Croft, Brackley
Northants, NN13 5ED (GB)
Inventor: Ferguson, James
26, Brookside Way Bloxham Banbury
Oxon, OX15 4XY (GB)
Inventor: Bentley, Andrew Charles
26, Nuffield Drive
Banbury, Oxon OX 16 7BX (GB)
Inventor: King, Christine Anne
7 Horton Drive, Middleton Cheney,
Banbury Oxon OX 17 2LP (GB)
Inventor: Newman, Alec Thomas
Greenways Warrington
Banbury, Oxon (GB)
- (74) Representative: Allard, Susan Joyce et al
BOULT, WADE & TENNANT, 27 Farnival Street
London EC4A 1PQ (GB)

(54) Packages containing comestibles.

- (57) A sealed package containing one or more powder, paste or liquid comestible preparation ingredients and being formed from substantially air- and water-impermeable materials, the said package comprising a compartment containing the said one or more comestible preparation ingredients, an inlet which communicates with the said compartment and an outlet which communicates with the said compartment the package being provided with control means to prevent the ingress of the powder, paste or liquid ingredient or ingredients into the outlet from the compartment containing the ingredients prior to the preparation of a comestible from the said ingredients.

FIG. 1D.



EP 0 451 980 A2

The present invention relates to packages containing comestibles and, in particular, to sealed packages which are formed from a substantially air- and water-impermeable material and which contain comestibles, preferably one or more ingredients for the preparation of beverages.

It has previously been proposed to seal beverage preparation ingredients in individual air-impermeable packages. For example, cartridges or capsules containing compacted ground coffee are known for use in certain coffee making machines which are generally termed "espresso" machines. In the production of coffee using these coffee machines the coffee cartridge is placed in a brewing chamber and hot water is generally caused to pass under pressure through the cartridge, thereby extracting the aromatic coffee constituents from the ground coffee and producing a coffee beverage.

Cartridges containing roast and ground coffee in which hot water flows under gravimetric force through the cartridge are also known. A cartridge of this general type is described in British Patent No. 1397116.

In our European Patent Application No. 87311325.2 there is described a package which contains at least one beverage preparation ingredient, e.g. roast and ground coffee. In a preferred embodiment the package is formed from a substantially air- and water-impermeable material and comprises a sealed body portion having a compartment containing the beverage ingredient and an outlet channel, the compartment and the outlet channel co-operating in such a manner that, in use, the beverage is filtered, thereby avoiding the necessity for an external filter.

There is also described in European Patent Application No. 87311325.2, a method for preparing a beverage which comprises positioning a beverage containing package at a brewing station, introducing water through water introduction means into the package, allowing the water to commingle with the beverage ingredient, and collecting the beverage so-formed through an outlet formed in the package.

The beverage packages as described in European Patent Application No. 87311325.2 are primarily intended to be used with a beverage preparation machine which handles the packages automatically or semi-automatically. A machine of this type is described in our European Patent Application No. 89302708.6. The packages may contain roast and ground coffee, leaf tea or one or more powder, paste or liquid beverage preparation ingredients such as powdered chocolate, powdered coffee or powdered soup. The beverage preparation ingredients are thus usually soluble and dissolve in the water introduced into the package thereby to form the beverage. However, problems may be encountered when the packages contain one or more powder, paste or liquid beverage preparation ingredients because the beverage preparation ingredient or ingredients may migrate

through the capsule or cartridge to the outlet nozzle. When the outlet for the beverage is formed in the package the beverage preparation ingredient or ingredients will then contaminate the cup which the beverage is to be dispensed, which is unsightly and not liked by the consumer, and/or contaminate the cutting or piercing tool used to form an outlet in the package during the beverage preparation cycle.

Packages which contain comestibles other than beverage preparation ingredients, for example mustard powder or paste, and powders or pastes for the preparation of sweet or savoury sauces are also known.

We have now developed a modified package containing one or more powder, paste or liquid comestible preparation ingredients which prevents the migration of the ingredient(s) into the outlet nozzle of the package.

Accordingly, the present invention provides a sealed package containing one or more powder, paste or liquid comestible preparation ingredients and being formed from substantially air- and water-impermeable materials, the said package comprising a compartment containing the said one or more comestible preparation ingredients, an inlet which communicates with the said compartment and an outlet which communicates with the said compartment the package being provided with control means to prevent the ingress of the powder, paste or liquid ingredient or ingredients into the outlet from the compartment containing the ingredients prior to the preparation of a comestible from the said ingredients.

The packages of the present invention are preferably packages which contain one or more powder, paste or liquid beverage preparation ingredients and the invention will be more fully described hereinbelow with reference to such packages.

The beverage package of the present invention preferably has a body portion which may be formed, for example, from a moulded plastics material. The inlet and/or outlet of the package may be closed by a plug of a plastics material moulded into the inlet and/or outlet during the moulding of the body portion. Alternatively, the inlet and/or outlet may be covered by a substantially air- and water-impermeable material, for example aluminium foil or a laminated material, such as a laminate of plastic material/metal foil/plastic material, prior to the opening of the inlet and/or outlet. Specific examples of materials which can be used are aluminium foil having a thickness in the range of from 30 to 60 micrometres coated with a layer of polypropylene or a laminate of polypropylene/aluminium foil/polyester.

The outlet in the package may be prepared during the beverage preparation cycle using a cutting and piercing tool for example of the type as described in our European Patent Application No. 89302708.6.

Alternatively, the inlet and/or outlet may be open

and the beverage package provided with an outer wrapping or the like. For example, a plurality of packages may be provided with a shrink wrapped outer layer.

The control means incorporated into the beverage packages of the present invention is generally positioned between the compartment containing the beverage preparation ingredient(s) and the outlet in order to prevent the entry of the beverage preparation ingredient(s) into the outlet before the beverage is prepared. The control means may be of various different designs and some examples of different control means are described below. It will be appreciated that whilst some control means can be used to prevent powders, pastes and/or liquids from migrating to the outlet, other control means are suitable only for preventing the ingress of powdered ingredients into the outlet.

A first type of control means comprises a flap positioned between the compartment and the outlet, the flap remaining closed under the weight of the ingredient(s), but deforming, in use, under the pressure of the beverage formed from the ingredient(s) thereby allowing the beverage to flow therethrough.

A second type of control means comprises a slit of a deformable material, such as a plastics material, metal foil or laminate, positioned between the compartment and the outlet, the slit in the material not allowing the ingredient(s) to pass through it but deforming in use, under the pressure of the beverage formed from the ingredient(s), to allow the beverage to flow therethrough.

A third type of control means comprises a seal positioned between the compartment and the outlet, the seal being held in position by an adhesive which is susceptible to mechanical peel and/or elevated temperature so that it is ruptured by the pressure and/or temperature of the beverage formed from the beverage preparation ingredient(s).

A fourth type of control means comprises a soluble plug or membrane of a water soluble harmless substance positioned between the compartment and the outlet, the plug or membrane dissolving when the beverage prepared from the beverage preparation ingredient(s) comes into contact therewith.

A fifth type of control means comprises a mechanical plug positioned within the outlet the mechanical plug being adapted to move from a position in which it closes the outlet to a position in which the outlet is opened. The mechanical plug may be moved from its closed to its open position by a piercing tool of the type as described in our European Patent Application No. 89302708.6.

The packages of the present invention are preferably provided with a recognition means whereby, in use, the package is identified by the machine into which it is placed for treatment and the identification of the package thereby causes it to be subjected to the

correct treatment steps including the introduction of a fluid medium into the package. For the preparation of beverages from powdered beverage preparation ingredients the fluid medium introduced into the package will be water, or a water/air mixture.

The recognition means may comprise one or more surface features formed in the body of the beverage package. For example, the package body may be provided with one or more indents, cut outs, protrusions or holes which can be identified by a mechanical sensor in the beverage preparation machine, the mechanical sensor registering the presence or absence of the indents, cut outs, protrusions or holes.

The recognition means may, alternatively, comprise a system which can be sensed by a simple optical device, for example a bar code printed onto the body of the package, a pattern of through holes in the package, a pattern of contrasting tones or colours printed onto the package or packages containing different comestibles being of different colours.

The recognition means may also comprise one or more strips of a magnetic material applied to the body of the package which can be read by an appropriate magnetic sensor; one or more shaped or divided areas of metal foil applied to the package body which cause an inductive effect on movement of the package in the machine, which inductive effect can be sensed; or one or more electrically conductive areas formed on the body of the package which can be sensed electrically.

As mentioned above, the package of the present invention contains powder, paste or liquid comestible preparation ingredients, preferably one or more powdered beverage preparation ingredients, for example, powdered chocolate, powdered soup, powdered coffee, and sugar and/or creamer, as desired. One machine which can readily be adapted for the preparation of a beverage from the preferred beverage package of the invention which includes a recognition means is described in our European Patent Application No. 89302708.6. The only modification required to be made to such a beverage preparation machine is to incorporate an appropriate sensor or sensors into it, the sensor or sensors being designed to read the particular coding on the capsule and to send a signal to the controller, which then selects the appropriate beverage preparation cycle.

The recognition system used on the beverage packages of the present invention enables a single beverage preparation machine to prepare from different beverage packages a great number of different beverages which require different beverage preparation conditions.

The packages of the present invention may be treated by a machine which includes therein one or more sensors which are adapted to sense and identify a recognition means provided on a package inserted into the machine.

The sensor may be, for example, a mechanical sensor, an optical sensor, a magnetic sensor, an electrical sensor or an inductive sensor. The machine is preferably adapted so that the package is handled automatically following its insertion into the machine. For example, a machine of the type as described in our European Patent Application No. 89302708.6 can be fitted with an appropriate sensor to sense and identify a recognition means provided on beverage packages intended for use therewith.

The present invention will be further described with reference to the accompanying drawings, in which:-

Figure 1A is a perspective view of part of a beverage package of the invention;

Figure 1B is a top plan view of the beverage package of Figure 1A;

Figure 1C is a section through the beverage package of Figure 1A along line A-A with the control means in operation;

Figure 1D is a section through the beverage package of Figure 1A along line A-A with the control means displaced by the flow of beverage;

Figure 2 is a schematic view of a second embodiment of the invention showing an alternative control means;

Figure 3 is a schematic view of a third embodiment of the invention showing an alternative control means;

Figure 4 is a schematic view of a fourth embodiment of the invention showing an alternative control means;

Figure 5A is a schematic view of a control means comprising a mechanical plug in its closed position; and

Figure 5B is a schematic view of the mechanical plug shown in Figure 5A in its open position.

Referring to Figures 1A and 1B, a beverage package body is shown at 1. The body may be formed, for example, from a moulded plastics material. The body 1 has a compartment 2 in which the powdered beverage preparation ingredient or ingredients are contained. The package body has an outlet nozzle 3 formed therein. The compartment 2 is separated from the area of the body in which the nozzle 3 is formed by means of an upstanding wall 4. An extension 5 of wall 4 separates the compartment 2 from a chamber 7 which is positioned between the said compartment 2 and the outlet nozzle 3. As best shown in Figure 1B, the flap 8 covers the chamber 7 and thereby prevents any powder which migrates from compartment 2 entering outlet nozzle 3. The flap 8 is joined along edge 9 thereof to a turned over portion of outside wall 10 of the container. The other three edges of the flap are in close proximity to the other walls of the chamber 7, but are not attached thereto. The flap 8 is constructed from a thin plastics material which is substantial enough to resist the weight of the powdered ingredi-

ent(s) before the capsule is used. The flap 8 may be attached by flap edge 9 to the turned over portion of wall 10 either by moulding a fine gap around the flap, or by shearing the flap on three sides as a postmoulding operation.

In use of the beverage package as shown in Figures 1A and 1B the bottom of the package is sealed by means of an aluminium foil or a laminated foil which is heat sealed to the lower edges of walls 4 and 10 and to the lower outer edge 23 of the package 1. Water enters the package at a pressure of about 10^5 Pa via inlet 12 which is opened by piercing or cutting the material covering the said opening. The water enters a channel 11 surrounding two sides of the compartment 2 containing the beverage ingredients. The water, which is under pressure, is forced through the elongate slots 13 formed in the wall 14 which separates channel 11 from compartment 2. The slots 13 as shown in Figure 1 are each approximately 0.5 mm wide and 3.5 mm long. The slots 13 act to impede the flow of water under pressure through them and give rise to turbulent flow of the water into the compartment 2. The turbulent flow effects a mixing and dissolution of the beverage preparation ingredients. The beverage so-formed, or the mixture of beverage ingredient(s) and water, then passes through a slit 25, formed between the bottom of wall 5 and the aluminium foil or laminated foil sealing the bottom of the package, into chamber 7. The pressure of the beverage, or the mixture of beverage ingredient(s) and water, causes the flap 8 to be displaced by the flow thereof and the beverage or mixture then flows into outlet nozzle 3. The beverage or mixture is then collected in a cup or other receptacle placed below the outlet nozzle 3.

Referring to Figures 1C and 1D, flap 8 is shown in its closed position in Figure 1C, hinged at 9 to a downturned portion of wall 10. In Figure 1D, flap 8 is opened by the flow of beverage under wall 5 via slit 25 in the direction indicated into compartment 7. The pressure of the beverage in compartment 7 causes the flap 8 to open and the beverage then flows in the direction indicated by the arrows into outlet nozzle 3. The beverage is then collected in a cup or other receptacle placed below the outlet nozzle 3.

Although in the embodiment as shown in Figures 1A to 1D the flap 8 has been shown extending in a substantially horizontal direction before it is displaced by the beverage, it may be preferable for the flap 8 to extend downwardly at a slight angle to the horizontal. The flap 8 thus bears firmly against wall 4 and will not be readily displaced during transit or storage of the package, thereby preventing accidental opening or partial opening of the flap. During the preparation of the beverage, the pressure of the beverage in compartment 7 is sufficient to cause flap 8 to flex and thereby to open.

The beverage package as illustrated in Figures

1A to 1D incorporates the recognition means which is a preferred feature of the invention. The package of the invention 1 containing one or more beverage preparation ingredients has a generally rectangular shape with flat top and bottom surfaces and is thereby suitable for insertion into a beverage preparation machine, for example of the type as described in our European Patent Application No. 89302708.6, longitudinally through a slot.

The package is also provided, as best shown in Figure 1B, with teeth 15 moulded along one side wall of compartment 2. The teeth 15 have recesses 16 formed therebetween. These teeth 15 are intended to enable the beverage package to be driven through a beverage preparation machine by the engagement of the teeth 15 with the tooth of a cam (not shown). The side wall 17 of the beverage package has an elongate recess 18 formed therein near to the leading end 19 of the package.

As the package is driven into the beverage preparation machine the elongate recess 18 is sensed as the side edge of the package passes beneath a sensing arm (not shown). The elongate recess has a plurality of upstanding pegs 20,21,22 located therein and as the package is driven into the machine by the engagement of the teeth 15 with the tooth of a cam, the sensor senses the presence or absence of upstanding pegs 20,21,22.

If one or more of pegs 20,21,22 is not present the sensing arm will thereby identify a different type of beverage package. The sensing arm operates a microswitch (not shown) which thereby transmits information concerning the presence or absence of the pegs on the package to the control mechanism for the beverage dispensing machine. The arrangement of pegs 20,21,22 on the package thus identifies the type of package to the controller which then selects the appropriate beverage preparation conditions.

The presence or absence of the pegs 20,21,22 provides scope for the sensing arm to sense up to 8 different types of beverage packages. Thus, if the presence of a peg at a particular location is coded as 1 and the absence of a peg coded as 0, the following code combinations can be achieved.

000

001

010

100

101

110

011

111

It will be understood that the presence of one or more further pegs at the top of package wall 17 would provide an even larger number of code combinations.

When the beverage preparation machine has selected the appropriate beverage preparation conditions, the water inlet 12 of the package is pierced or cut, an outlet 3 formed in the package and water caused to flow under pressure through the compartment containing the beverage ingredient(s). The chosen beverage then being collected in a cup or receptacle placed below the outlet 3 of the package.

It will be appreciated that for different types of packages the beverage or other ingredient may require significantly different treatment. Thus, some beverages will be prepared with hot water and some with cold water, whilst others, such as espresso coffee, will require a smaller amount of water for their preparation. Preparation times may require to be varied. Similarly water and/or air may be required either for preparing/dispersing the beverage/content of the package or for the purpose of pre-cleaning an inlet pipe or flushing out a used package. Furthermore, a user may require a particular beverage to be dispensed in combination with one or more ingredients from independent sources, e.g. powdered milk and/or sugar.

Figure 2 shows an alternative embodiment of the invention. In this embodiment a plastic film or foil laminate 31 is welded to a shoulder 32 formed in the walls of chamber 7 and surrounding the said chamber 7. The plastic film or foil laminate 31 has a slit 33 formed therein. Any powder migrating from chamber 2 through slit 25 cannot pass under its own weight through the slit 33, because the slit 33 will not open. However, when a beverage is prepared from the powdered ingredient(s) contained in chamber 2 the flow of the pressurized liquid or liquid/powder mixture through chamber 7 forces the slit 33 to open and the beverage then flows to outlet nozzle 3 and thence to a cup or receptacle positioned below outlet nozzle 3 for collection.

A still further embodiment of the invention is shown in Figure 3. This arrangement is similar to the arrangement shown in Figure 2. A seal 34, for example of a plastics film material, is bonded around its edges to the continuous shoulder 32 surrounding chamber 7 by means of a low tack adhesive. The low tack adhesive may be susceptible either to mechanical peel when a beverage formed from the beverage preparation ingredient(s) contained in chamber 2 passes via slit 25 to chamber 7, or by the action of the elevated temperature of the beverage, or a combination of both of these mechanisms. The seal thus ruptures and the beverage flows through outlet nozzle 3 to a cup or other receptacle positioned below outlet nozzle 3.

A still further embodiment of the invention is shown schematically in Figure 4 where a plug 35 of a

soluble material covers the outlet nozzle. The beverage prepared from the beverage ingredient(s) in compartment 2 passes through slit 25 and into chamber 7. The beverage then contacts the soluble plug 35 and causes the plug to dissolve, thus uncovering the outlet nozzle through which the beverage then flows into a cup or other receptacle. The soluble plug 35 should, of course, be prepared from a harmless material, or from a material which is to be incorporated into the beverage. For example, the plug could be prepared from sugar for the preparation of sweetened beverages.

An alternative embodiment of the invention is shown schematically in Figures 5A and 5B. Referring to these Figures the body of a beverage package is shown generally at 40. The compartment containing the beverage ingredient or ingredients is shown at 41. The package has an outlet nozzle 42 formed therein which is surrounded by a counterbore 43. The outlet nozzle is prevented from communicating with the remainder of the body of the package by means of a seal 44 which is moulded into the plastics material from which the body portion of the package is formed. The seal is surrounded by a line of weakness 45. The outlet and the base of the package are closed by an air- and water-impermeable material 46, for example a metal foil. The outlet nozzle 42 is sealed, as mentioned above, by rupturable seal 44 and a mechanical plug 47 lies within the outlet nozzle. The plug 42 is provided with wings 48 which sit within a groove (not shown) formed in outlet nozzle 42.

In use of the package in a beverage preparation machine a platen 49 containing a piercing and folding mechanism 50 is positioned below the package. The piercing and folding mechanism is moved in an upwards direction by the beverage dispensing machine and causes the air- and water-impermeable material 46 to be cut. The mechanism 50 also folds the cut material back into the counterbore 43. The piercing and folding mechanism thus moves in an upwardly direction and the unserrated edge 51 of this mechanism co-operates with wings 48 formed on mechanical plug 47, thereby causing the mechanical plug to move upwards in the nozzle and to rupture rupturable seal 44. The mechanical plug moves in a groove in the outlet nozzle 42 (not shown). Accordingly, as shown in Figure 5B there is no longer any obstruction between the outlet nozzle and the remainder of the beverage package. Thus, when a beverage is prepared it can flow via the bore 52 of mechanical plug 47 through outlet aperture 42 into a cup or other receptacle positioned below platen 49.

Although the present invention has been described with specific reference to the preparation of beverages from powdered beverage preparation ingredients, it is to be understood that the invention is not limited to packages containing only powdered beverage ingredients, but also includes within its

scope packages containing other powder, paste or liquid comestibles.

5 Claims

1. A sealed package containing one or more powder, paste or liquid comestible preparation ingredients and being formed from substantially air- and water-impermeable materials, the said package comprising a compartment containing the said one or more comestible preparation ingredients, an inlet which communicates with the said compartment and an outlet which communicates with the said compartment the package being provided with control means to prevent the ingress of the powder, paste or liquid ingredient or ingredients into the outlet from the compartment containing the ingredients prior to the preparation of a comestible from the said ingredients.
2. A package as claimed in claim 1 wherein the outlet is covered by a substantially air- and water-impermeable material prior to the formation, in use, of an outlet in the package.
3. A package as claimed in claim 1 wherein the outlet is closed by a plug prior to the formation, in use, of an outlet in the package.
4. A package as claimed in any one of the preceding claims wherein the control means comprises a flap positioned between the compartment and the outlet, which flap remains closed under the weight of the ingredient or ingredients, but which is adapted, in use, to deform under the pressure of the comestible formed from the ingredient(s) and thus to allow the comestible to flow therethrough.
5. A package as claimed in any one of claims 1 to 3, wherein the control means comprises a slit deformable material positioned between the compartment and the outlet, which material does not deform under the weight of the ingredient or ingredients, but which is adapted, in use, to deform under the pressure of the comestible formed from the ingredient(s) and thus to allow the comestible to flow therethrough.
6. A package as claimed in any one of claims 1 to 3 wherein the control means comprises a seal positioned between the compartment and the outlet, which is ruptured by the pressure and/or temperature of the comestible formed from the ingredient(s) and thus allows the comestible to flow therethrough.

11

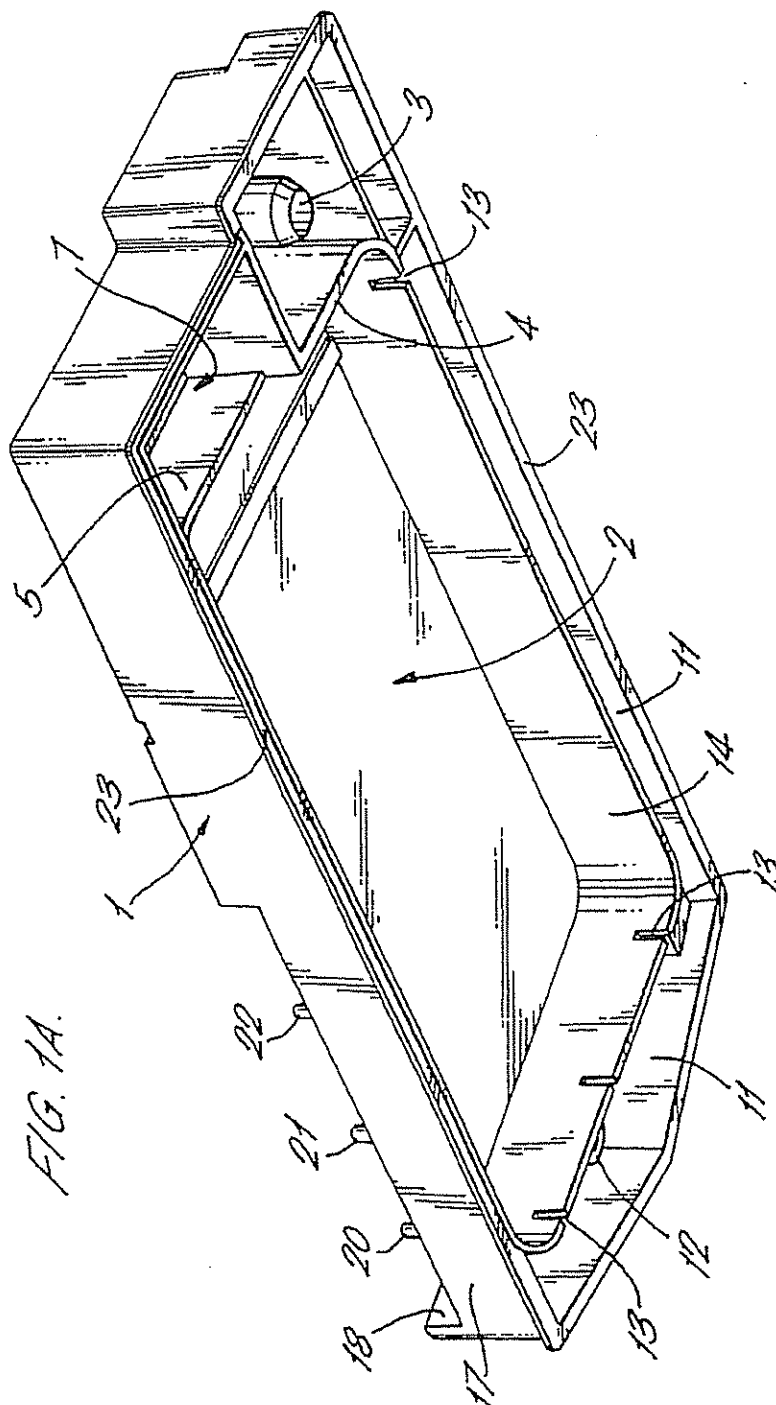
EP 0 451 980 A2

12

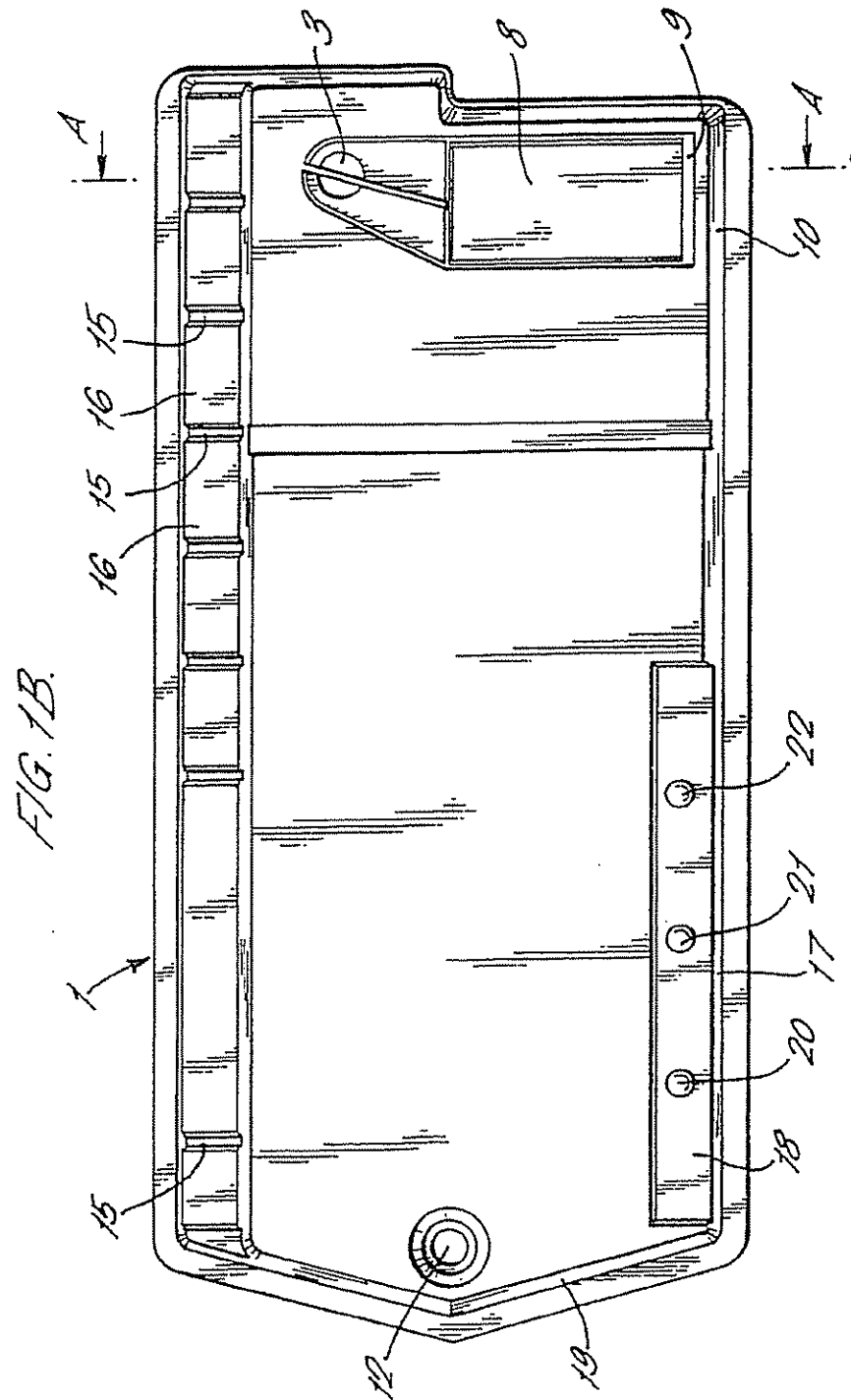
7. A package as claimed in any one of claims 1 to 3 wherein the control means comprises a water soluble plug of a harmless material positioned between the compartment and the outlet, the plug dissolving when the comestible formed from the ingredient(s) comes into contact therewith. 5
8. A package as claimed in any one of claims 1 to 3 wherein the control means comprises a mechanical plug positioned within the outlet, the plug being adapted to move from a position in which it closes the outlet nozzle to a position in which the outlet nozzle is opened. 10
9. A package as claimed in any one of the preceding claims wherein the powder, paste or liquid ingredient or ingredients are beverage preparation ingredients. 15
10. A package as claimed in any one of the preceding claims which is provided with a recognition means whereby, in use, the package is identified by the machine into which it is placed for treatment therefrom and the identification of the package thereby causes it to be subjected to the correct treatment steps including the introduction of a fluid medium into the package. 20 25
11. A package as claimed in claim 10 wherein the recognition means comprises one or more surface features formed in the body of the package. 30
12. A package as claimed in claim 10 wherein the recognition means comprises a bar code. 35
13. A package as claimed in claim 10 wherein the recognition means comprises a pattern of holes formed in the body of the package.
14. A package as claimed in claim 10 wherein the recognition means comprises a pattern of contrasting tones or colours. 40
15. A package as claimed in claim 10 wherein the recognition means comprises one or more strips of a magnetic material. 45
16. A package as claimed in claim 10 wherein the recognition means comprises an inductive device. 50
17. A package as claimed in claim 10 wherein the recognition means comprises a plurality of electrically conductive means. 55

7

EP 0 451 980 A2



EP 0 451 980 A2



EP 0 451 980 A2

FIG. 1C.

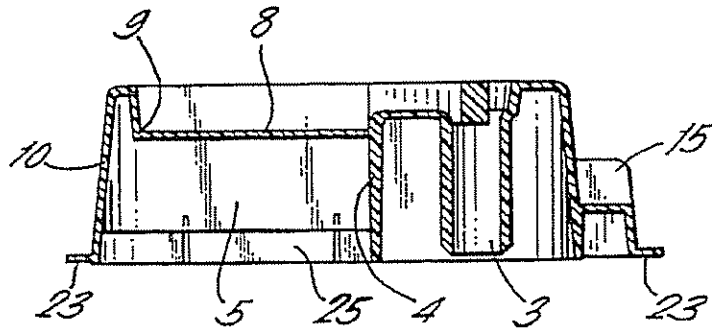
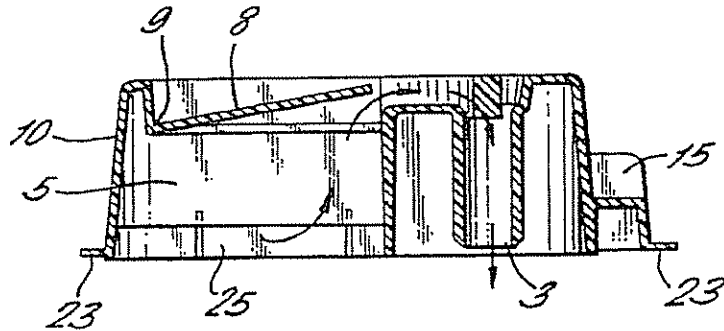
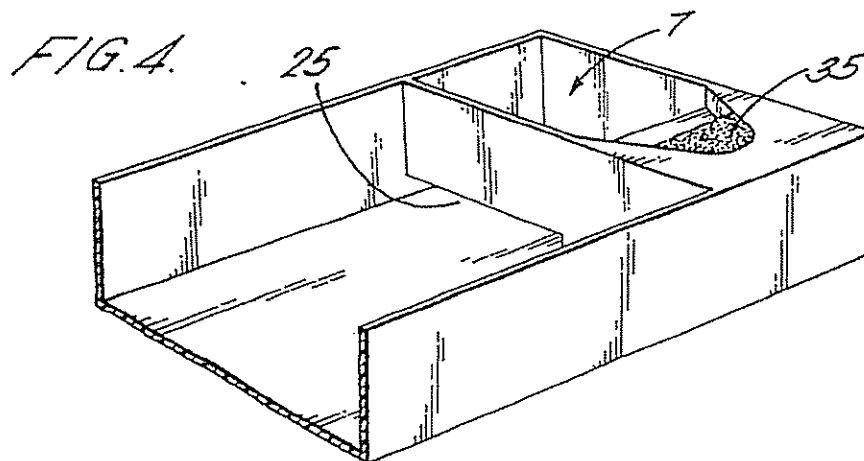
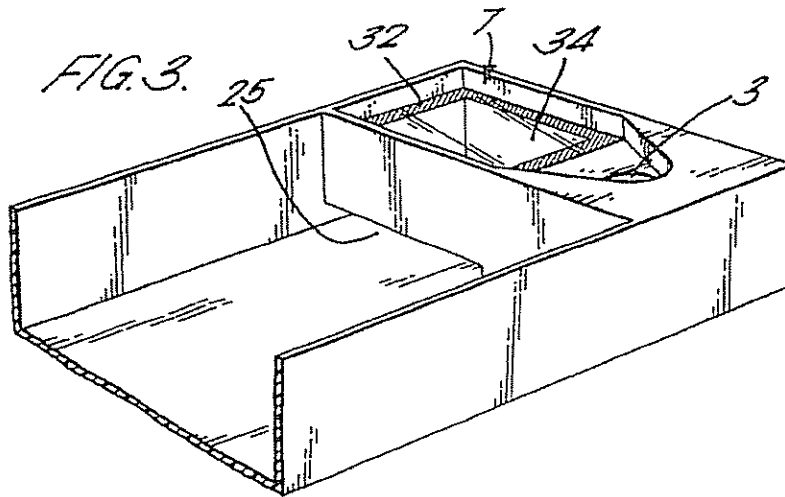
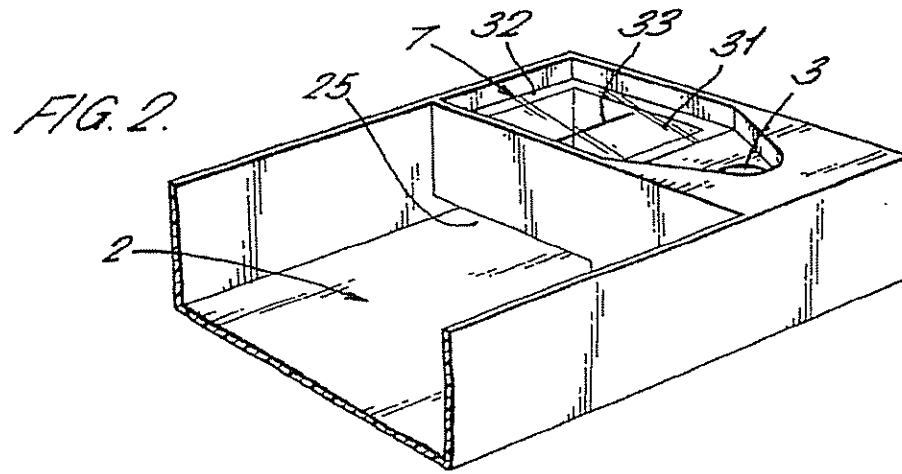


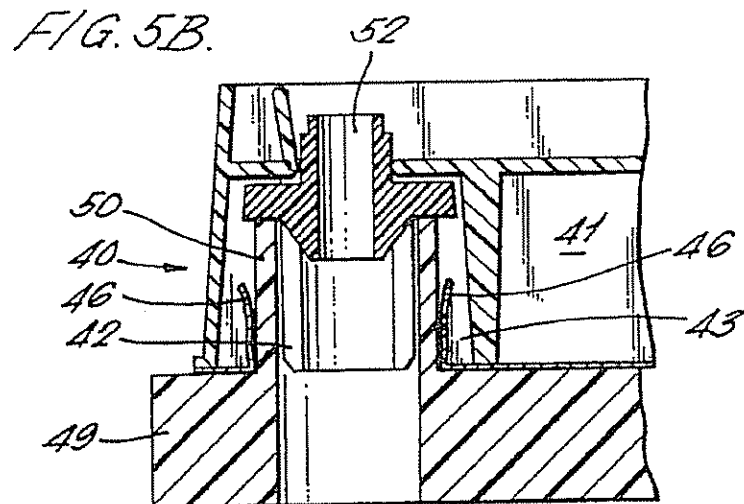
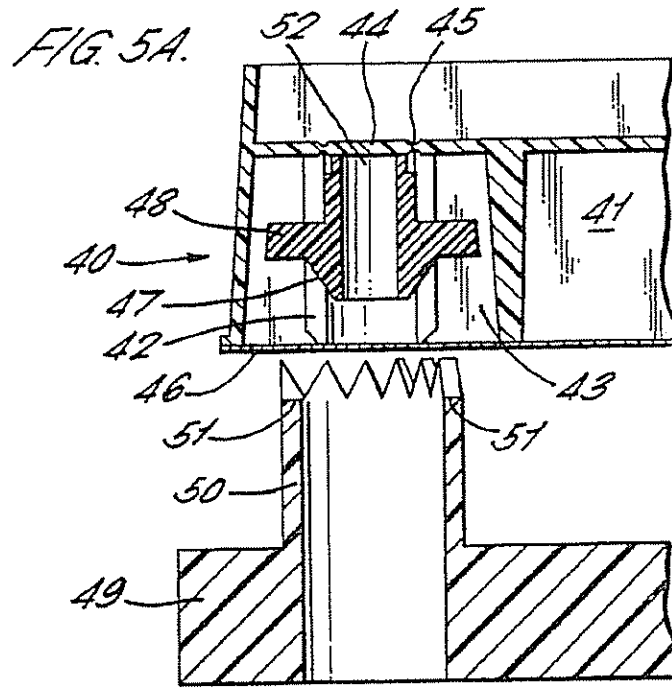
FIG. 1D.



EP 0 451 980 A2



EP 0 451 980 A2





US006810788B2

(12) **United States Patent**
Hale

(10) **Patent No.:** **US 6,810,788 B2**
(45) **Date of Patent:** **Nov. 2, 2004**

(54) **BEVERAGE CARTRIDGE AND FILTER ASSEMBLY**

(76) **Inventor:** Robert Hale, 40 Ridgeway Rd.,
Scarborough Ontario (CA), M1R 4G3

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** 10/384,126

(22) **Filed:** Mar. 7, 2003

(65) **Prior Publication Data**

US 2003/0222089 A1 Dec. 4, 2003

Related U.S. Application Data

(60) Provisional application No. 60/363,940, filed on Mar. 14, 2002, and provisional application No. 60/424,312, filed on Nov. 7, 2002.

(51) **Int. Cl.**⁷ A47J 31/00; B65B 29/02

(52) **U.S. Cl.** 99/295; 99/323; 426/77;
426/84; 426/433

(58) **Field of Search** 99/295, 302 R,
99/323, 317, 322; 426/77, 79, 84, 115,
433, 435

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,778,739 A	1/1957	Rodth	99/171
2,783,704 A	3/1957	Liebelt	99/295
2,599,886 A	8/1959	Rodth	99/295
2,905,075 A	9/1959	Liebelt	99/295
2,968,560 A	1/1961	Goros	99/77.1
3,292,527 A	12/1966	Stasse	99/295
3,607,297 A	9/1971	Fasano	99/28
3,615,708 A	10/1971	Abile-Gal	99/171
3,628,444 A	12/1971	Mazza	99/275
3,823,656 A	7/1974	Vander	99/295
3,937,134 A	2/1976	Molenaar et al.	99/295
4,136,202 A	1/1979	Favre	426/77
4,417,504 A	11/1983	Yamamoto	99/306
4,487,114 A	12/1984	Ahdenour	99/295

4,520,716 A	6/1985	Hayes	99/306
4,550,024 A	10/1985	le Grasse	426/77
4,579,048 A	4/1986	Stover	99/280
4,846,052 A	7/1989	Favre et al.	99/295
4,859,337 A	8/1989	Woltermann	210/474
4,867,993 A	9/1989	Nordskog	426/77
4,886,674 A	12/1989	Seward et al.	426/79

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

CA	657233	2/1963
CA	1219139	3/1987
CA	2071893	4/1991
CA	2046558	1/1992
CA	1304323	6/1992
CA	2072300	* 1/1993
CA	1318605	6/1993

(List continued on next page.)

OTHER PUBLICATIONS

U.S. patent application Ser. No. 2001/0047724, Lazaris et al., filed Dec. 6, 2001.*

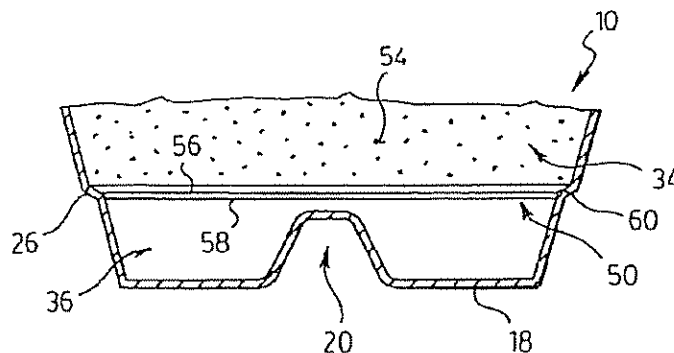
Primary Examiner—Reginald L. Alexander

(74) *Attorney, Agent, or Firm*—Dinsmore & Shohl LLP

(57) **ABSTRACT**

A beverage cartridge comprises a container having a side-wall extending from a first surface and a lip provided at an open end of the container. A cover is coupled to the lip of the container to cover the open end and seal the container. A sloped step is formed in the sidewall and a laminated filter structure is coupled to the sloped step. The laminated filter structure subdivides the container to form a brewing chamber and a beverage receiving chamber. The laminated filter structure includes first and second filter elements, both having edge portions. A seal is provided between the edge portions of the first and the second filter elements. The second filter element has a higher wet strength than the first filter element and the second filter element is located downstream of the first filter element. A beverage powder is contained in the brewing chamber. The container is pierceable to allow injection of liquid into the brewing chamber and to allow prepared beverage to be extracted from the container.

19 Claims, 6 Drawing Sheets



US 6,810,788 B2

Page 2

U.S. PATENT DOCUMENTS

4,921,712 A 5/1990 Malmquist 426/77
 4,975,292 A 12/1990 Loizzi 426/77
 5,008,013 A 4/1991 Favre et al. 210/482
 5,028,328 A * 7/1991 Long 210/477
 5,113,752 A 5/1992 Brewer 99/295
 5,190,653 A * 3/1993 Herrick et al. 210/477
 5,197,374 A 3/1993 Fond 99/295
 5,242,702 A 9/1993 Fond 426/433
 5,243,164 A 9/1993 Erickson et al. 219/10.55
 5,292,437 A 3/1994 Ford 210/478
 5,298,267 A 3/1994 Gruenbacher
 5,325,765 A 7/1994 Sylvan et al. 99/295
 5,327,815 A 7/1994 Fond et al. 99/295
 5,343,799 A 9/1994 Fond 99/295
 5,347,916 A 9/1994 Fond et al. 99/295
 5,398,595 A 3/1995 Fond et al. 99/295
 5,398,596 A 3/1995 Fond 99/295
 5,424,083 A 6/1995 Lozito 426/82
 5,472,719 A * 12/1995 Favre 426/77
 5,567,461 A 10/1996 Lehrer 426/417
 5,637,335 A 6/1997 Fond et al. 426/84
 5,656,311 A 8/1997 Fond 426/84
 5,656,316 A 8/1997 Fond et al. 426/433
 5,773,067 A 6/1998 Freychet et al. 426/506
 5,826,492 A 10/1998 Fond et al. 99/295
 5,840,189 A * 11/1998 Sylvan et al. 210/474
 5,897,899 A 4/1999 Fond 426/112

5,948,455 A 9/1999 Schaeffer et al. 426/77
 6,025,000 A 2/2000 Fond et al. 426/433
 2001/0048957 A1 12/2001 Lazaris et al. 426/77
 2002/0015768 A1 2/2002 Masek et al. 426/115
 2002/0020659 A1 2/2002 Sweeney et al. 210/416.3
 2002/0088807 A1 7/2002 Perkovic et al. 220/654

FOREIGN PATENT DOCUMENTS

CA 2067515 2/1999
 CA 2246849 * 3/1999
 CA 2284092 * 9/1999
 CA 2362118 * 9/2000
 CA 2046557 10/2001
 CA 2046559 10/2001
 EP 0 114 717 A2 * 1/1984
 EP 0 211 511 A1 * 2/1987
 EP 0 468 078 B1 * 1/1992
 EP 0 468 080 B1 * 1/1992
 EP 0 524 464 A1 * 1/1993
 EP 0 554 469 A1 * 8/1993
 EP 1 190 959 A1 * 3/2002
 FR 2 617 389 * 1/1989
 GB 1427375 * 10/1973
 GB 2 023 086 A * 12/1979
 GB 2183459 * 6/1987 426/112
 NL 8701627 * 2/1989
 WO WO 00/56629 * 9/2000

* cited by examiner

U.S. Patent

Nov. 2, 2004

Sheet 1 of 6

US 6,810,788 B2

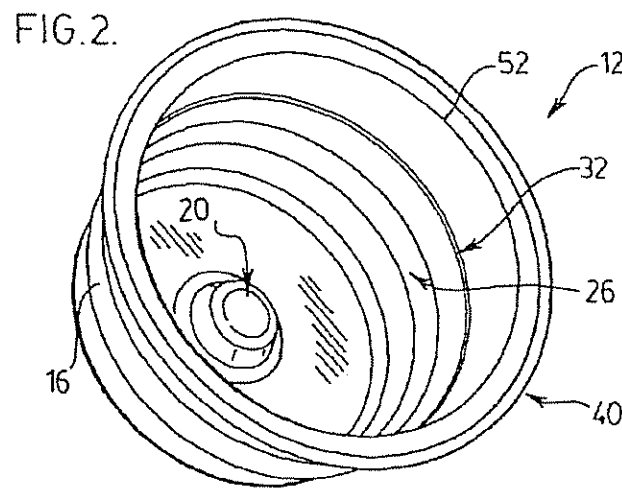
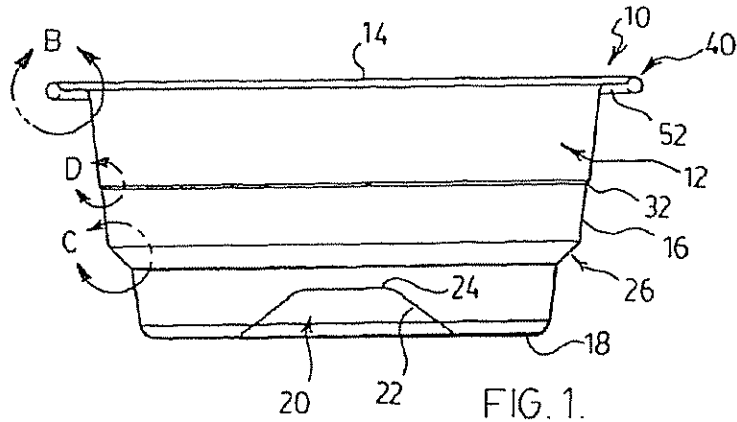
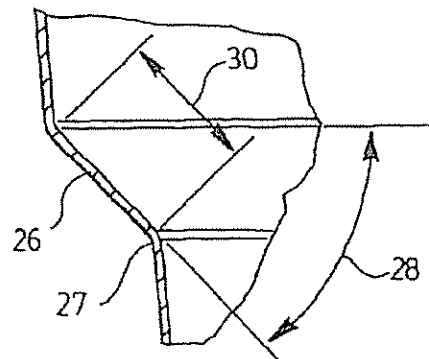


FIG. 3.

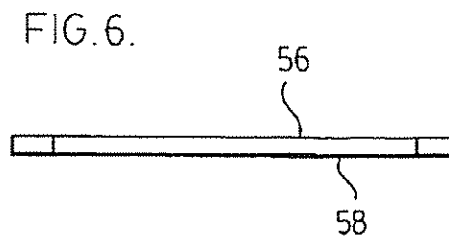
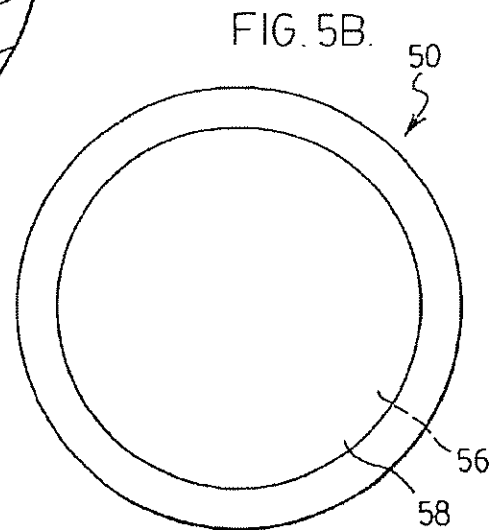
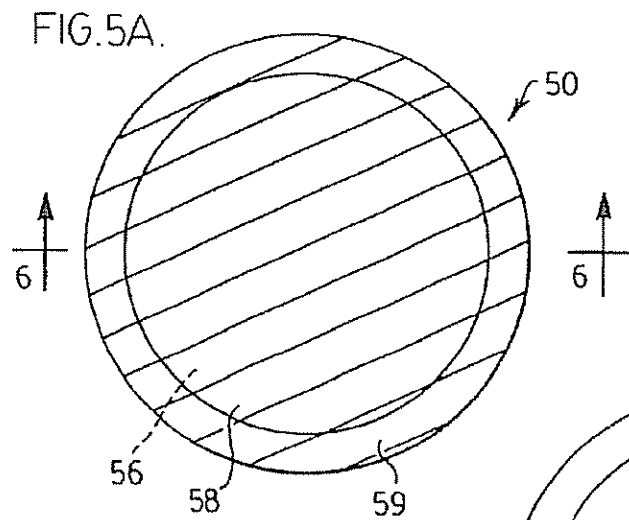
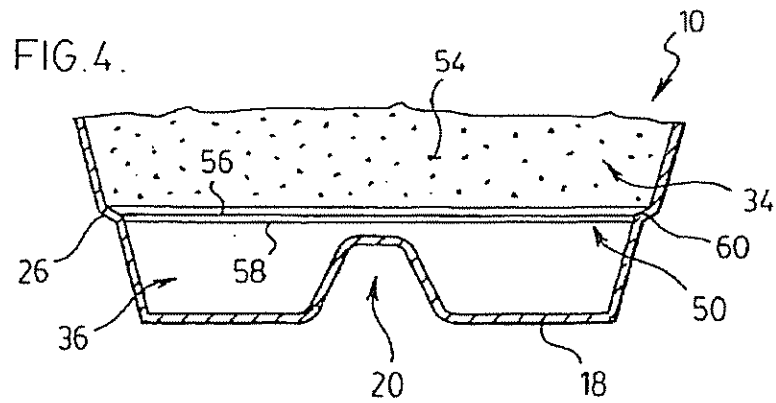


U.S. Patent

Nov. 2, 2004

Sheet 2 of 6

US 6,810,788 B2



U.S. Patent

Nov. 2, 2004

Sheet 3 of 6

US 6,810,788 B2

FIG. 7.

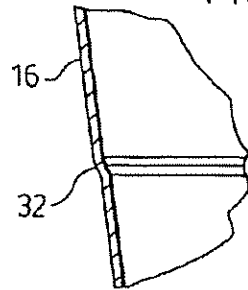


FIG. 8.

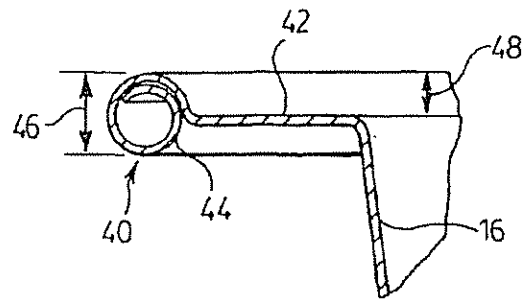


FIG. 9.

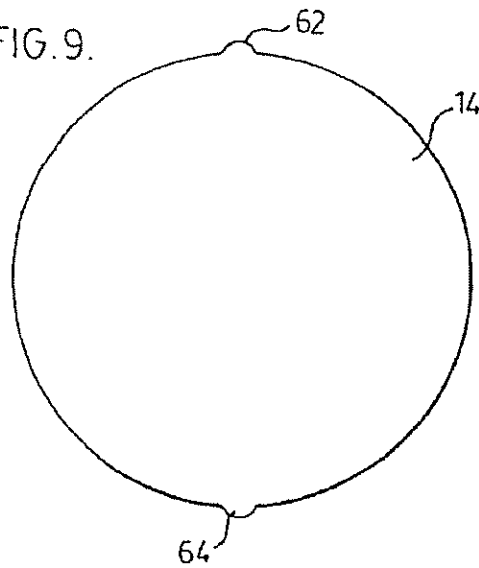


FIG. 10.

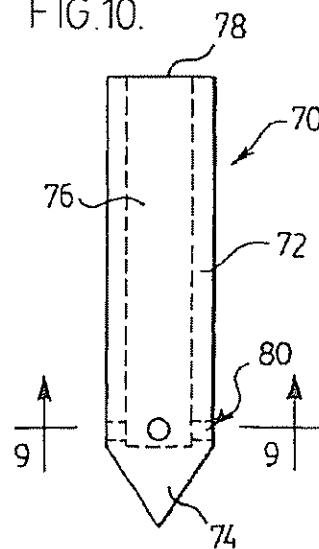
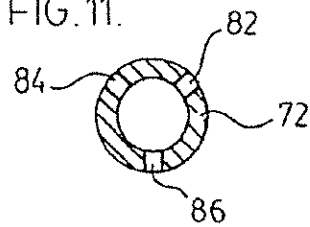


FIG. 11.



U.S. Patent

Nov. 2, 2004

Sheet 4 of 6

US 6,810,788 B2

FIG. 12.

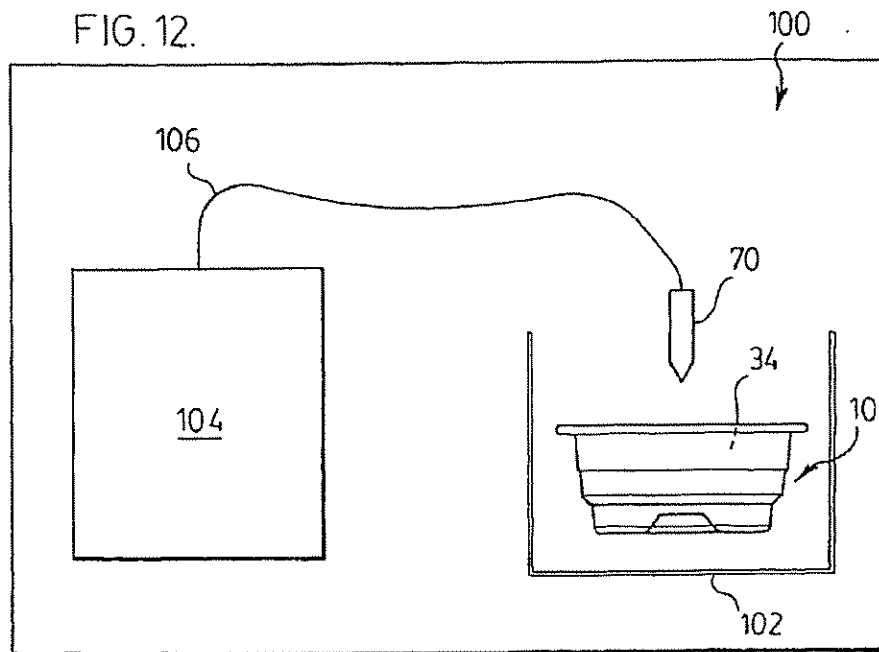
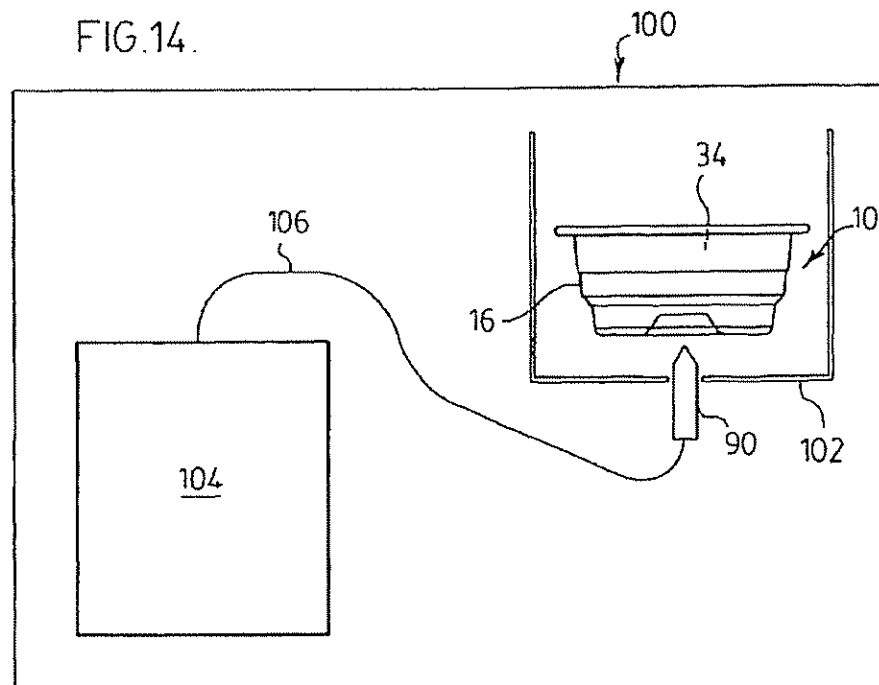


FIG. 14.



U.S. Patent

Nov. 2, 2004

Sheet 5 of 6

US 6,810,788 B2

FIG. 13.

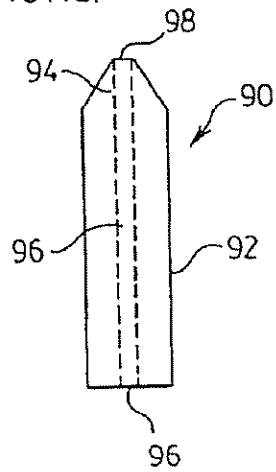


FIG. 15.

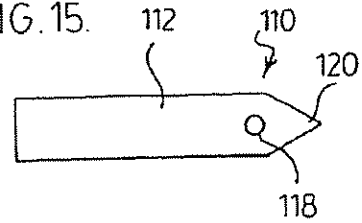


FIG. 16.

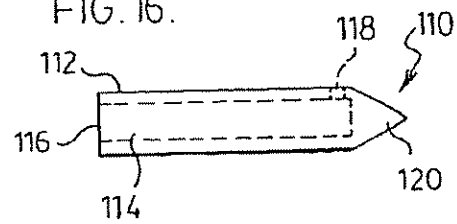
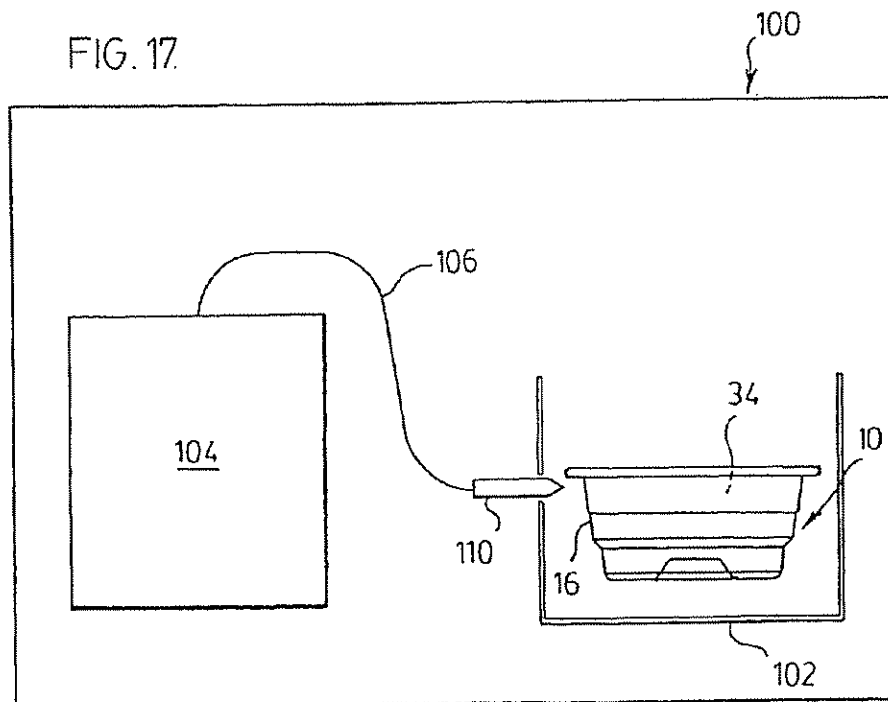


FIG. 17.



U.S. Patent

Nov. 2, 2004

Sheet 6 of 6

US 6,810,788 B2

FIG. 18.

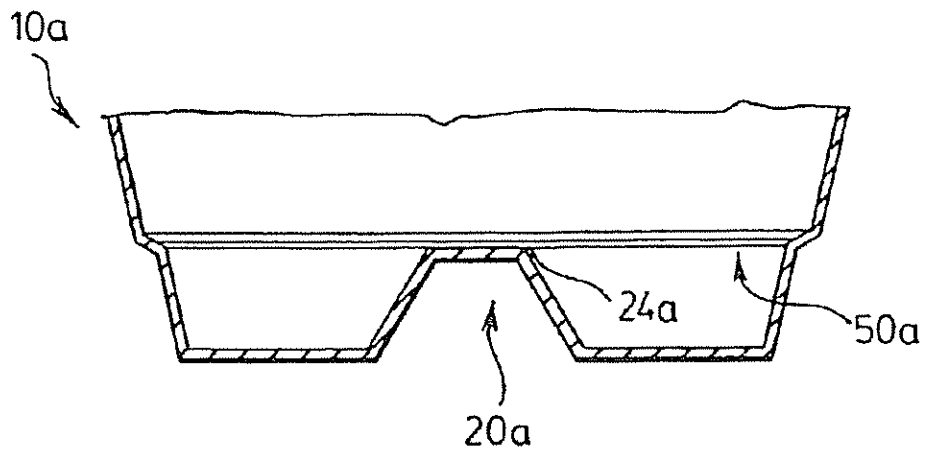
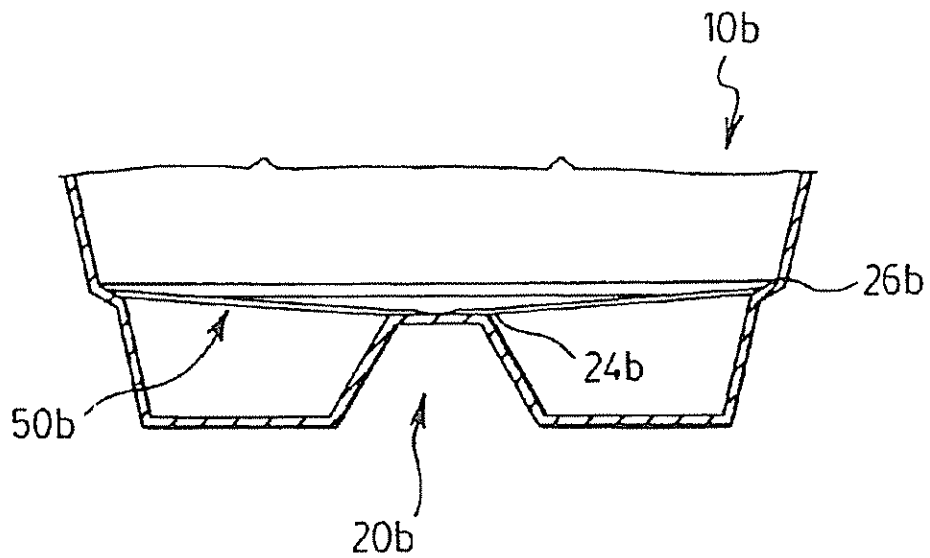


FIG. 19.



US 6,810,788 B2

1

BEVERAGE CARTRIDGE AND FILTER ASSEMBLY

This application claims the benefit of U.S. Provisional Application No. 60/363,940, filed Mar. 14, 2002 and U.S. Provisional Application No. 60/424,312, filed Nov. 7, 2002.

FIELD OF THE INVENTION

The present invention relates to beverage dispensing machines and, in particular, to a beverage cartridge and filter assembly for use in a beverage dispensing machine.

BACKGROUND OF THE INVENTION

Single serving beverage cartridges are very popular because they provide a fresh tasting beverage quickly and conveniently. Beverages such as coffee are typically produced by beverage dispensing machines that use beverage cartridges holding beverage products.

Beverage cartridges typically comprise a sealed container having a top surface, a bottom surface and a filter. The filter subdivides the sealed container to provide an upper brewing chamber for housing a powdered or ground beverage and a lower chamber for receiving the filtered beverage. Beverage cartridges of the prior art are typically comprised of plastic or metal.

Prior art beverage cartridges are often expensive and difficult to manufacture. Reducing the number of processing steps required to form the cartridge typically results in lower item cost and reduces the manufacturing time. Stepped beverage cartridges, such as disclosed in European Patent Application No. 1101430, can be produced using a one-step vacuum forming process when they are manufactured from plastic. Such cartridges are difficult to manufacture when they are formed from a metal, such as aluminum, however.

Installing a filter in a beverage cartridge can be time consuming as several mounting steps are typically required. The heat sealing techniques that are currently employed to fix a filter in a cartridge, have been known to damage the beverage cartridge because the amount of working space inside the cartridge is limited. Some of these production faults are not discovered until the beverage cartridge has reached the consumer.

The type of filter used in a beverage cartridge has significant impact on the quality of the beverage product produced. Paper filters produce a high quality beverage. These filters, however, lack wet strength and can remove too much of the essential coffee oils and flavour. Metal filters, on the other hand, provide sufficient strength. Metal filters, however, allow higher levels of coffee oils to pass through into the brewed beverage. The high levels of produce a different taste in the coffee that is often undesirable. As will be appreciated, a filter is desired that has sufficient dry and wet strength to withstand the high pressures and temperatures associated with brewing but not produce a bitter tasting brewed beverage, as some synthetic filter media are known to do.

It is therefore an object of the present invention to provide a beverage cartridge and filter assembly that obviates or mitigates at least one of the above disadvantages.

SUMMARY OF THE INVENTION

According to one aspect of the present invention, there is provided a laminated filter assembly for subdividing a beverage cartridge to form a brewing chamber. The laminated filter assembly includes a first filter element having a

2

first edge portion, the first filter element being comprised of a first material, a second filter element having a second edge portion, the second filter element being comprised of a second material, the second material differing from the first material. A seal is provided between the first edge portion and the second edge portion. The second filter element has a higher wet strength than the first filter element and the second filter element is located downstream of the first filter element.

According to another aspect of the present invention, there is provided a beverage cartridge comprising a container having a sidewall extending from a first surface and a lip provided at an open end of the container, a cover coupled to the lip of the container to cover the open end and seal the container, a sloped step formed in the sidewall, a filter coupled to the sloped step, the filter subdividing the container to form a brewing chamber and a beverage receiving chamber, and a beverage powder contained in the brewing chamber. The container is pierceable to allow injection of liquid into the brewing chamber and to allow prepared beverage to be extracted from the container.

According to another aspect of the present invention, there is provided a beverage cartridge including a container having a sidewall extending from a first surface and a lip provided at an open end of the container. A cover is coupled to the lip of the container to cover the open end and seal the container. A step is formed in the sidewall and a laminated filter structure is coupled to the step, the laminated filter structure subdividing the container to form a brewing chamber and a beverage receiving chamber. A beverage powder is contained in the brewing chamber. The laminated filter structure has a first filter element with a first edge portion, a second filter element with a second edge portion. A seal is provided between the first edge portion and the second edge portion. The second filter element is of a different material than the first filter element. The second filter element has a higher wet strength than the first filter element and the second filter element is located downstream of the first filter element. The container is pierceable to allow injection of liquid into the brewing chamber and to allow prepared beverage to be extracted from the container.

It is an advantage of an aspect of the present invention that a filter assembly is provided that has sufficient strength to withstand high pressures.

In another aspect, the sloped step allows the filter to be fused thereto more quickly and efficiently. The present invention provides a further advantage in that the stepped beverage cartridge can be manufactured by a single processing step regardless of the type of material that it is comprised of.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be described more fully with reference to the accompanying drawings in which:

FIG. 1 is a side sectional view of a beverage cartridge according to the present invention;

FIG. 2 is an isometric view of a container of the beverage cartridge of FIG. 1;

FIG. 3 is an enlarged view of detail C of FIG. 1;

FIG. 4 is a side sectional view of a portion of the beverage cartridge of FIG. 1 including a filter;

FIG. 5A is a top view of the filter of FIG. 4;

FIG. 5B is a top view of an alternative embodiment of the filter of FIG. 4;

US 6,810,788 B2

3

FIG. 6 is a sectional view along 6—6 of the filter of FIG. 5A;

FIG. 7 is an enlarged view of detail D of FIG. 1;

FIG. 8 is an enlarged view of detail B of FIG. 1;

FIG. 9 is a top view of a cover of the beverage cartridge of FIG. 1;

FIG. 10 is a side view of an injector according to an embodiment of the present invention;

FIG. 11 is a view of 9—9 of FIG. 8;

FIG. 12 is a schematic side view of a beverage brewing apparatus and a beverage cartridge according to an embodiment of the present invention;

FIG. 13 is a side view of an injector according to another embodiment of the present invention;

FIG. 14 is a schematic side view of a beverage brewing apparatus and a beverage cartridge according to another embodiment of the present invention;

FIG. 15 is a top view of an injector according to still another embodiment of the present invention;

FIG. 16 is a side view of the injector of FIG. 14;

FIG. 17 is a schematic side view of a beverage brewing apparatus and a beverage cartridge according to another embodiment of the present invention;

FIG. 18 is a side sectional view of a portion of a beverage cartridge according to another embodiment of the present invention; and

FIG. 19 is a side sectional view of a portion of a beverage cartridge according to yet another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a beverage cartridge is indicated generally by the numeral 10. The beverage cartridge 10 includes a container 12 and a cover 14. The container 12, which is shown in FIG. 2, includes a generally conical shaped sidewall 16 having a sloped step 26 and a shoulder 32 formed therein. The sidewall 16 extends from a generally circular bottom wall 18 to an upper edge 52 of the container 12. A lip 40 extends outwardly from the upper edge 52 of the container 12. The bottom wall 18 of the container 12 includes a recess 20. The recess 20 is defined by a generally conical shaped wall 22 that extends upwardly from the bottom wall 18 and an offset bottom wall 24.

The sloped step 26, which is shown in FIGS. 1 and 3, is inclined at an angle 28 relative to a plane parallel to the bottom wall 18 of the container 12. The sloped step 26 has a length 30 and extends around the circumference of the container 12. The angle 28 is preferably 45 degrees, however, angles of between 55 and 90 degrees may also be used.

A filter 50, which is shown in FIG. 4, is coupled to the sloped step 26 about an outer edge 60 of the filter 50. The filter 50 subdivides the beverage cartridge 10 into a brewing chamber 34, which is located between the cover 14 and the filter 50, and a beverage receiving chamber 36, which is located between the filter 50 and the bottom wall 18. The brewing chamber 34 contains a powdered beverage product 54 for mixing with a liquid. Following mixing, the liquid is passed through the filter 50 to provide a brewed beverage. The brewed beverage is retrievable from the beverage receiving chamber 36.

The filter 50 is a laminated structure having first, second and third filter elements 56, 58 and 59, respectively, that are

4

welded to one another about their edges, as best shown in FIGS. 5 and 6. In a preferred embodiment, the first filter element 56 is comprised of a blend of cellulose and polymer fibres. The first filter element 56 offers good particle retention, infusion and taste neutrality, all of which are desirable when producing a brewed beverage product. An example of a suitable material for the first filter element is Type 483402 filter paper, which is supplied by J R Crompton USA Ltd.

The second filter element 58 is comprised of a porous layer of a relatively high strength material, such as a polymer. The second filter element 58 is located downstream of the first filter element 56 and provides added support thereto because it has a higher wet strength. The addition of the second filter element 56 enables the filter 50 to withstand high liquid pressures in excess of 3 bar and liquid temperatures of up to at least 200 degrees Fahrenheit, while maintaining the brewing characteristics of the first filter element 56. A suitable material for the second filter element 58 is Dupont Vexar Standard E-2082. The second filter element 58 is made from any non-woven polymer material that is compatible with the first filter element 56 and the cartridge. In the present embodiment, the second filter element 58 is a polypropylene material of sufficient strength to withstand water pressures of from 0.5 to 5 bar and water pressures of up to 210 degrees Fahrenheit.

In a preferred embodiment, the second filter element 58 is made from a polypropylene diamond shaped extruded or molded material. The diamond shaped extruded material includes strands that are welded or joined together to inhibit separation of the strands. This is advantageous over woven filters, which tend to separate at the time of cutting. The diamond shaped extruded material is expandable to accommodate the first filter element 56, which expands due to the heat and pressure produced during the brewing process. Thus, the second filter element 58 is elastic to allow expansion, thereby increasing the gross area of the filter 50. The elasticity of the second filter element 58 is limited, however, to provide support for the first filter element 56, without fracture or splitting of the first filter element 56. The second filter element 58 therefore forms an effective supporting structure without inhibiting the ability of the first filter element 56 from performing effectively.

In both the first and second filter elements 56, 58, the weight and/or porosity govern the extraction level of the filtered beverage. It will be appreciated by those skilled in the art that the weight and/or porosity may be varied in order to achieve the desired filtration.

The third filter element 59 comprises a plurality of polyester threads that are laminated to a downstream side of the second filter element 58.

The filter 50 is die stamped and the first, second and third filter elements 56, 58, 59, respectively, are welded together at respective outer edges thereof. The weld process is performed when the filter 50 is formed, prior to being secured inside the beverage cartridge 10. During the weld process, the second filter element 58 melts, thereby sealing to the first filter element 56 and the edges of the polyester threads of the third filter element 59 are welded to the second filter element 58, on the opposite side as the first filter element 56. The heat passes through the second filter element 58 to the first filter element 56 such that the first filter element 56 is not scorched. The third filter element 59 serves to further strengthen the resulting filter 50.

The outer edge 60 of the filter 50 is preformed to the shape shown in FIG. 4 and heat sealed to the sloped step 26. In

US 6,810,788 B2

5

order for a good seal to be provided in the beverage cartridge 10, the melt point of the second filter element 58 is lower than the melt point of the container 12. This ensures that the edge portion of the second filter element 58 melts to the sloped step 26 in the heat sealing process. The length 30 of the sloped step 26 is maximized in order to provide sufficient surface area for securing the filter 50 thereto. The sloped step 26 provides a larger surface area for welding than a generally right angled step, which results in a higher strength welded connection. Advantageously, the stress concentration on the filter that is caused by a right angled step is reduced by the use of the sloped step 26.

During the heat sealing process, the heat sealing device contacts the container 12 on the external side of the sloped step 26. Therefore, the sloped step 26 of the container is heated and the second filter element 58 melts, thereby bonding the filter 50 to the sloped step 26. An additional advantage of the sloped step 26 is that the filter 50 is less likely to break at a location adjacent the fused outer edge 60 thereof. This portion of the filter 50 is in contact with a lower edge 27 of the sloped step. In a generally right-angled step, the lower edge is much sharper, which can cause damage to the filter 50.

Advantageously, the filter 50 bows when in use and the offset bottom wall 24 provides a support for the filter 50 which bows downwardly when in use. The sloped step 26 facilitates the downward bowing of the filter 50 and the filter 50 is permitted to expand. The offset bottom wall 24 supports the bowed filter, inhibiting the filter from bowing down to contact a remainder of the bottom wall 18.

In an alternative embodiment, the third filter element 59 is not employed. Thus, the filter 50 includes only the first and second filter elements 56, 58, respectively, as shown in FIG. 5B. This embodiment of the filter 50 is desirable in application where the first and second filter elements 56, 58, respectively, are of sufficient strength to withstand the internal pressure in the cartridge 10.

The shoulder 32, which is shown in FIGS. 2 and 7, is spaced between the filter 50 and the cover 14 to create a baffle to direct liquid away from the sidewall 16 of the container 12, towards the centre of the brewing chamber 34. The shoulder 32 facilitates an even distribution of the liquid throughout the brewing chamber 34, which enhances the extraction or dilution process and provides a brewed beverage of a higher quality. The shoulder 32 further functions to increase the strength of the container 12 so that the container 12 is able to withstand internal and external pressures due to the extraction process and handling of the container 12, respectively.

The lip 40, which is shown in greater detail in FIG. 8, includes a generally flat portion 42 that extends outwardly from the upper edge 52 of the sidewall 16 and an outwardly extending coiled portion 44. The coiled portion 44 forms a bead, having an outer diameter 46, around the circumference of the container 12. The coiled portion 44 extends a distance 48 above the upper edge 52 of the container 12 to provide a recess for receiving the cover 14. The distance 48 is approximately equal to half of the outer diameter 46 so that the coiled portion 44 is generally centered relative to the generally flat portion 42.

The lip 40 is used as a reference point for locating the filter 50 with respect to the container 12 and depositing the powdered beverage into the brewing chamber 34 during beverage cartridge assembly. The lip 40 further adds strength to the container 12 and provides surface area to facilitate ejection from a beverage brewing apparatus.

6

The cover 14 includes a pair of tabs 62, 64 that extend outwardly therefrom, as shown in FIG. 9. Referring to FIGS. 8 and 9, the cover 14 is coupled to the flat portion 42 of the lip 40 of the container 12 and the tabs 62, 64 are coupled to the coiled portion 44. The coiled portion 44 of the lip 40 protects the edge of the cover 14 from accidentally being dislodged from the container 12.

The tabs 62, 64 of the cover 14 are used for centering the cover 14 by aligning the tabs 62, 64 with the lip 40. The tabs 62, 64 further facilitate proper orientation of the beverage cartridge 10 during printing at the time of assembly or thereafter, for example, so that a logo or designation is printed at the same spot on each beverage cartridge 10. Orientation of the beverage cartridge 10 in the beverage brewing apparatus or other applications, can also be controlled using the tabs 62, 64 as locating devices.

The container 12 is comprised of an aluminum sheet having a polypropylene film on one side thereof. The film layer is directed toward the interior of the container 12. The aluminum sheet typically has a thickness of between 0.50 and 1.20 mm. The container 12 is typically formed by a stamping process. The container 12 may also be formed by any other suitable process, such as drop forming, hydro forming, or vacuum forming, for example. A suitable aluminum sheet material for the container 12 is Product Type: B 342go, provided by Alupak AG, or Alcan product no. 3175. The container 12 may alternatively be comprised of a plastic having an oxygen barrier.

After forming the container 12, the filter 50 is coupled to the sloped step 26, as described herein above. Next, the beverage product is deposited into the brewing chamber 34 and the cover 14 is attached to the container, thereby sealing the cartridge 10.

The cover 14 is comprised of a similar polypropylene coated aluminum foil as the container 12 and is heat-sealed to the lip 40 of the container 12. Alternatively, any material that can be adhered to the polypropylene of the container 12 and offer an effective oxygen barrier may be used. The beverage cartridge 10 is able to withstand water pressures of 0.5 to 9 bar when used in conjunction with an appropriate beverage brewing apparatus.

The beverage cartridge 10 may be produced from aluminum using a one step stamping process. When working with aluminum, defects often occur during the manufacturing process when beverage cartridges having steps disposed at angles of approximately 90 degrees, are produced. The sloped step 26 is advantageous and allows the beverage cartridge 10 to be produced in a single manufacturing step.

The generally conical shaped wall 22 and the offset bottom wall 24 of the recess 20 provide structural rigidity to the container 12. In this embodiment, the filter 50 is spaced from the offset bottom wall 24 prior to brewing. The offset bottom wall 24 provides support to the filter 50, which expands during the brewing process. The recess 20 functions to inhibit the filter 50 from touching the bottom wall 18 of the container 12, which is undesirable because this would inhibit the entire filter area from filtering the beverage product. The recess 20 further serves to limit stretching or expansion of the first filter element 56 in order to prevent the first filter element 56 from fracturing, if the second filter element 58 fails to do so. It is not necessary for the filter 50 to contact the offset bottom wall 24 provided that the second filter element 58 provides sufficient strength to suspend the filter 50 above the bottom wall 18.

The generally conical shaped wall 22 and the offset bottom wall 24 also serve to allow the container 12 to

US 6,810,788 B2

7

expand by expansion of the bottom wall 18, when the beverage cartridge 10 is under pressure during use. As pressure is applied in the container 12, the bottom wall 18 expands outwardly, thereby increasing the volume of the interior of the container 12. The filter 50 also expands, bowing downwardly in the container 12.

Referring now to FIG. 10, there is shown an injector 70 for use with a beverage brewing apparatus 100, shown in FIG. 12. The injector 70 includes a generally cylindrical body 72 having a pointed tip 74 for piercing the beverage cartridge 10. The body 72 includes a bore 76 that extends partially therethrough. The bore 76 includes an inlet 78 for receiving a liquid and an outlet 80 for delivering the liquid to the brewing chamber 34 of the beverage cartridge 10. As shown in FIG. 11, the outlet 80 includes first, second and third passages 82, 84 and 86, respectively, which are spaced about the generally cylindrical body 72 of the injector 70. In a preferred embodiment, the passages 82, 84 and 86 are spaced apart by an angle of approximately 120 degrees with respect to one another.

As shown in FIG. 12, the injector 70 is mounted above a beverage cartridge receiving cavity 102 of the beverage brewing apparatus 100. The beverage cartridge receiving cavity 102 and injector 70 are movable relative to one another to pierce the beverage cartridge 10 generally from the top, through the cover 14. Liquid travels from the container 104 to the injector 70 through a liquid conduit 106. The location of the passages 82, 84 and 86 allows the liquid to be delivered laterally with respect to the injector 70 to distribute the liquid evenly throughout the beverage powder.

Referring to FIG. 13, a second embodiment of an injector 90 is generally shown. The second injector includes a generally cylindrical body 92 and a truncated tip 94. A bore 96 extends through the length of the body 92 and includes an inlet 96 and an outlet 98 for delivering liquid to the beverage cartridge 10.

As shown in FIG. 14, the second injector 90 is mounted below the beverage cartridge receiving cavity 102 of the beverage brewing apparatus 100. The beverage cartridge receiving cavity 102 and the second injector 90 are movable relative to one another to pierce the beverage cartridge 10 generally from below, through the recess 20 and the filter 50. The location of the outlet 98 allows the liquid to be diffused in an upward direction to provide an equal spray over the entire powdered beverage product.

Referring to FIGS. 15 and 16, a third embodiment of an injector 110 is shown. The third injector 110 includes a generally cylindrical body 112 and a pointed tip 120. A bore 114 extends partially through the body 112 and includes an inlet 116 and an outlet 118. The outlet 118 is generally oval shaped to allow a large volume of liquid to be expelled therefrom.

As shown in FIG. 17, the third injector 110 is mounted adjacent to the beverage cartridge receiving cavity 102 of the beverage brewing apparatus 100. The beverage cartridge receiving cavity 102 and the third injector 110 are movable relative to one another to pierce the beverage brewing chamber 34 of the beverage cartridge 10 generally from the side, through the sidewall 16. The outlet 118 is directed upwardly to facilitate mixing of the liquid with the powdered beverage. The third injector 110 is particularly useful for applications in which it is desirable to agitate the powdered beverage product by allowing the injector 110 to enter the brewing chamber 34 at a location that is slightly above the filter 50. The third injector 110 forces the liquid upward through the powdered beverage to agitate the powdered beverage before the liquid flows through the filter 50.

8

In use, the beverage cartridge 10 is inserted into the beverage receiving cavity 102 of the beverage brewing apparatus 100. An example of a beverage brewing apparatus that may be used is described in U.S. patent application Ser. No. 10/185,196, which is assigned to the assignee of the present invention and herein incorporated by reference. A liquid injector device having an injector 70, 90 or 110 pierces the beverage cartridge 10 to deliver hot liquid to the brewing chamber. The hot liquid mixes with the powdered beverage. The mixing in the brewing chamber is facilitated by the shoulder 32, which creates a baffle. The hot liquid mixture then passes through the filter 50 and prepared beverage flows into the beverage receiving chamber 36. An extractor device (not shown) pierces the beverage cartridge 10 to extract the prepared beverage.

The beverage cartridge 10 is designed to facilitate entry of the injector 70, 90 or 110 and the extractor device into the container 12. The ideal location of liquid entry and prepared beverage exit from the beverage cartridge 10 is determined based on the powdered beverage product contained and to be extracted.

Once the beverage cartridge 10 has been ejected from the beverage brewing apparatus 100, following beverage preparation, the beverage cartridge 10 may be recycled in its entirety by an appropriate recycling authority. Beverage cartridges made of aluminum are more easily recycled because they do not include the variety of polymers that are typically present in plastic beverage cartridges.

Referring to FIG. 18, an alternative embodiment of a beverage cartridge 10a is shown. In this embodiment, a filter 50a is welded to an offset bottom wall 24a of a recess 20a by a heat sealing process. The offset bottom wall 24a provides support to the filter 50a. This is particularly useful in cases where the powdered beverage product is heavy or the pressure of the water injected into the cup is very high. Brewing a beverage in the beverage cartridge 10a causes the filter area to be increased as a result of the stretching or expansion of the filter 50a. This stretching action (or bowing of the filter) is desirable and is promoted by the manner in which the filter 50a is suspended between the sloped step 26 and the offset bottom wall 24a.

Another alternative embodiment of a beverage cartridge 10b is shown in FIG. 19. A filter 50b is welded to an offset bottom wall 24b of recess 20b. Because the offset bottom wall 24b is offset from the plane of sloped step 26b, the filter 50b is generally concave in shape. This arrangement further promotes expansion of the filter 50b to increase the overall filter area.

The filters 50, 50a and 50b have been shown as being flat or concave, however, it will be appreciated that the filter 50 is not flat when heat sealed to the sloped step 26 of the container 12. Instead, the filters will be fixed to the sloped step 26, causing the edges of the filter 50 to be tilted upwardly. Alternatively, the filter could be conical in shape.

The many features and advantages of the invention are apparent from the detailed

specification and, thus, it is intended by the appended claims to cover all such features and advantages of the invention that fall within the true spirit and scope of the invention. Further, since numerous modifications and changes may occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation illustrated and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

US 6,810,788 B2

9

What is claimed is:

1. A beverage cartridge comprising:

- a container having a sidewall extending from a first surface and a lip provided at an open end of the container;
 - a cover coupled to the lip of the container to cover the open end and seal the container;
 - a step formed in the sidewall;
 - a laminated filter structure coupled to the step, the laminated filter structure subdividing the container to form a brewing chamber and a beverage receiving chamber, the laminated filter structure having a first filter element with a first edge portion, the first filter element being comprised of cellulose fibres, a second filter element with a second edge portion, the second filter element being comprised of strands of extruded polypropylene fibres that are joined together to inhibit separation of the strands, and a seal provided between the first edge portion and the second edge portion, the second filter element having a higher wet strength than the first filter element and the second filter element being located downstream of the first filter element, such that the elasticity of the second filter element permits expansion of the second filter element under pressure while providing support for the first filter element; and
 - a beverage powder contained in the brewing chamber, wherein the container is pierceable to allow injection of liquid into the brewing chamber and to allow prepared beverage to be extracted from the container.
2. The beverage cartridge according to claim 1, wherein said first filter element is comprised of a blend of cellulose and polymer fibres.
3. The beverage cartridge according to claim 1, wherein said laminated filter structure further includes a third filter element comprised of a third material, fixed to one of said second and said first filter elements, at an edge portion thereof.
4. The beverage cartridge according to claim 3, wherein said third filter element is comprised of polyester.
5. The beverage cartridge according to claim 3, wherein said third filter element is comprised of polyester threads fixed to said second filter element.
6. The beverage cartridge according to claim 1, further comprising a support, offset from the first surface for supporting a portion of the laminated filter structure during brewing.
7. The beverage cartridge according to claim 6, wherein the support comprises a generally conical recess having an offset wall spaced from the first surface.
8. The beverage cartridge according to claim 1, wherein the step is sloped.
9. The beverage cartridge according to claim 8, wherein said laminated filter structure is heat sealed to the sloped step.
10. The beverage cartridge according to claim 1, further comprising a shoulder formed in the sidewall in the brewing

10

chamber, for facilitating distribution of the liquid in the brewing chamber.

11. A process for fabricating the beverage cartridge of claim 1, comprising:

- forming the container;
- coupling the filter to the step of the container by applying a heating device to an exterior of said container, at said step;
- depositing said beverage powder in said brewing chamber of said container; and
- heat sealing said cover to said lip of said container.

12. The process for fabricating the beverage cartridge according to claim 11, wherein forming the container includes stamping said container from an aluminum sheet having a polypropylene file on one side thereof.

13. The process for fabricating the beverage cartridge according to claim 12, wherein said stamping is a one-step stamping process.

14. The process for fabricating the beverage cartridge according to claim 12, further comprising:

- stamping said first and said second filter elements; and
- welding said first and second filter elements together at outer edges thereof, prior to the step of coupling the filter to the step of the container.

15. A laminated filter structure for subdividing a beverage cartridge to form a brewing chamber, said laminated filter structure comprising:

- a first filter element having a first outer edge portion, the first filter element being comprised of cellulose fibres;
- a second filter element having a second outer edge portion, the second filter element being comprised of strands of extruded polypropylene fibres that are joined together to inhibit separation of the strands; and
- a seal provided between said first outer edge portion and said second outer edge portion;

wherein said second filter element has a higher wet strength than said first filter element and said second filter element is located downstream of said first filter element, such that the elasticity of the second filter element permits expansion of the second filter element under pressure while providing support for the first filter element.

16. The laminated filter structure according to claim 15, wherein said first filter element is comprised of a blend of cellulose and polymer fibres.

17. The laminated filter structure according to claim 15, further comprising a third filter element comprising a third material fixed to one of said first and said second filter elements.

18. The laminated filter structure according to claim 17, wherein said third filter element is comprised of polyester.

19. The laminated filter structure according to claim 17, wherein said third filter element is comprised of polyester threads fixed to said second filter element.

* * * * *



US006645537B2

(12) **United States Patent**
Sweeney et al.

(10) Patent No.: **US 6,645,537 B2**
(45) Date of Patent: **Nov. 11, 2003**

(54) **BEVERAGE FILTER CARTRIDGE**

(75) Inventors: Richard Sweeney, Winchester, MA (US); Nicholas G. Lazaris, Newton, MA (US); Roderick H. Beaulieu, Cumberland, RI (US); William P. Bucuzzo, Haverhill, MA (US)

(73) Assignee: Keurig, Incorporated, Wakefield, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 147 days.

(21) Appl. No.: 09/782,622

(22) Filed: Feb. 13, 2001

(65) **Prior Publication Data**

US 2002/0020659 A1 Feb. 21, 2002

Related U.S. Application Data

(60) Provisional application No. 60/183,708, filed on Feb. 18, 2000.

(51) Int. Cl.⁷ B65B 29/02

(52) U.S. Cl. 426/79; 426/113; 426/115; 426/433; 99/295; 99/317; 206/6.5; 206/222

(58) Field of Search 426/77, 79, 86, 426/112-113, 115, 590, 394, 431-433; 99/295, 316, 317, 323; 206/0.5, 219, 222

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,154,215 A * 10/1964 Vesconte 220/97
4,875,620 A * 10/1989 Lane, Sr. 229/1.5 B

5,242,702 A * 9/1993 Fond 426/433
5,243,164 A * 9/1993 Erickson et al. 219/10.55 E
5,325,765 A * 7/1994 Sylvan et al. 99/295
5,738,786 A * 4/1998 Winnington-Ingram 210/474
5,840,189 A 11/1998 Sylvan et al. 210/474

FOREIGN PATENT DOCUMENTS

DE 1536372 1/1970
GB 2023086 A * 12/1979

* cited by examiner

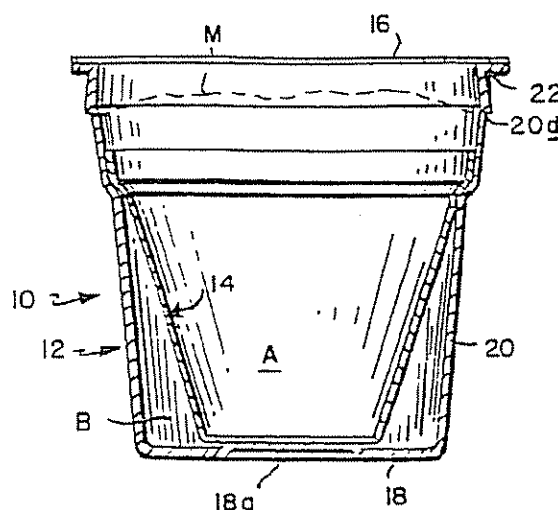
Primary Examiner—Drew Becker

(74) *Attorney, Agent, or Firm*—Samuels, Gauthier & Stevens

(57) **ABSTRACT**

A beverage filter cartridge includes a cup-shaped outer container with a bottom and a side wall extending upwardly from the bottom wall to a circular rim surrounding an upper opening. The side wall has an upper section extending downwardly from the rim to an intermediate section, and a tapered lower section configured to provide a plurality of circumferentially spaced flutes extending downwardly from the intermediate section to the bottom wall. A filter element subdivides the interior of the container into first and second chambers. A beverage medium is stored in the first chamber. A cover is joined to the side wall at the rim to close the upper opening. The cover is yieldably pierceable to accommodate an injection of liquid into the first chamber for combination with the beverage medium to produce a beverage. The filter element is permeable to accommodate a flow of the beverage from the first chamber into the second chamber, and the bottom wall is yieldably pierceable to accommodate an outflow of the beverage from the second chamber to the exterior of the cartridge.

8 Claims, 5 Drawing Sheets



U.S. Patent

Nov. 11, 2003

Sheet 1 of 5

US 6,645,537 B2

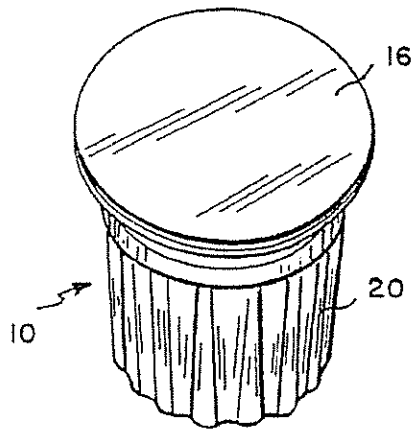


FIG. 1

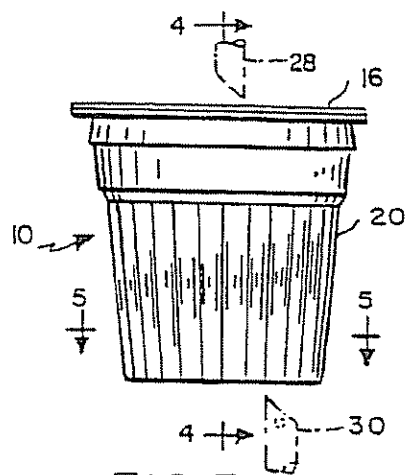


FIG. 3

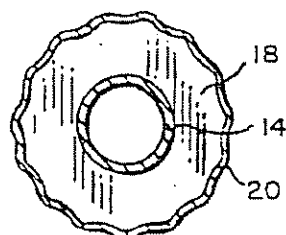


FIG. 5

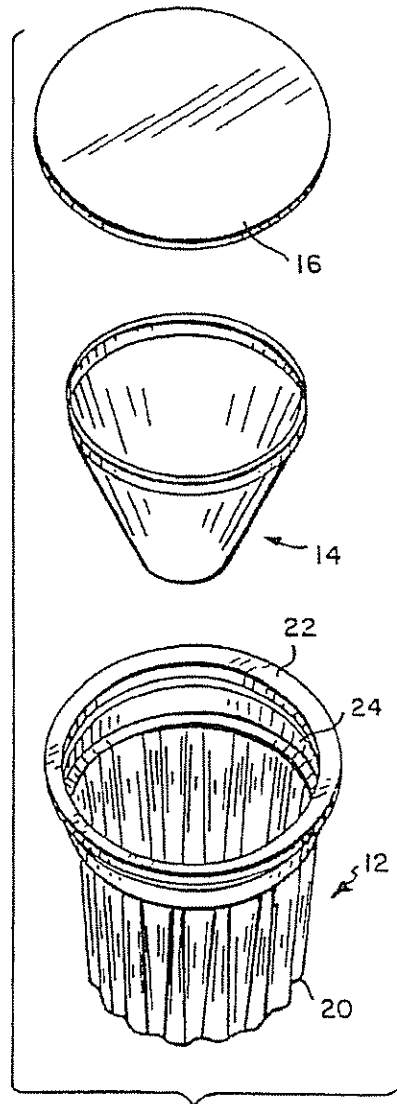


FIG. 2

U.S. Patent

Nov. 11, 2003

Sheet 2 of 5

US 6,645,537 B2

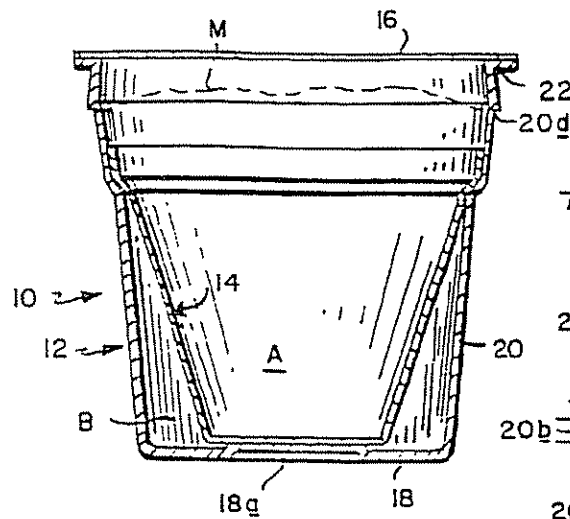


FIG. 4

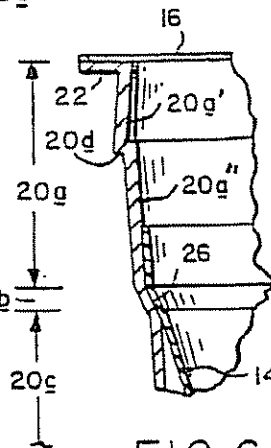


FIG. 6

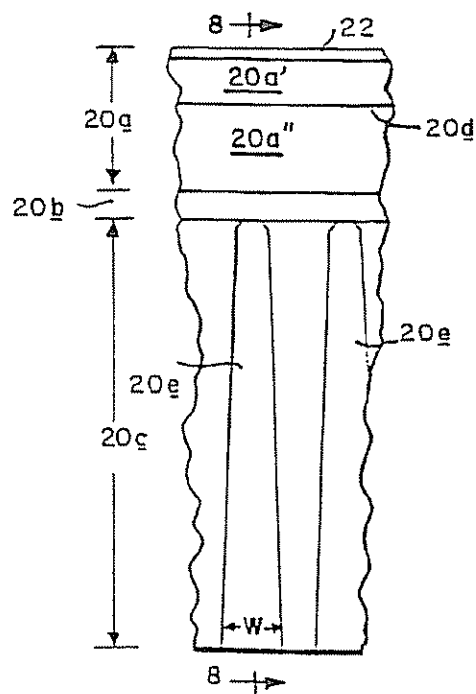


FIG. 7

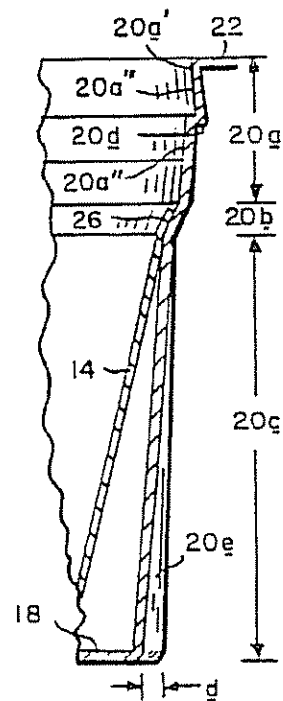


FIG. 8

U.S. Patent

Nov. 11, 2003

Sheet 3 of 5

US 6,645,537 B2

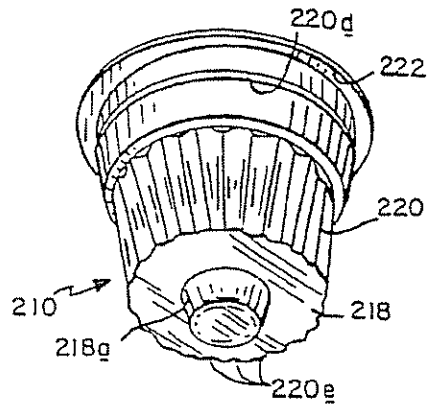


FIG. 9

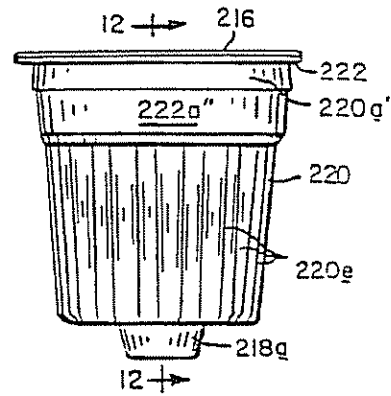


FIG. 10

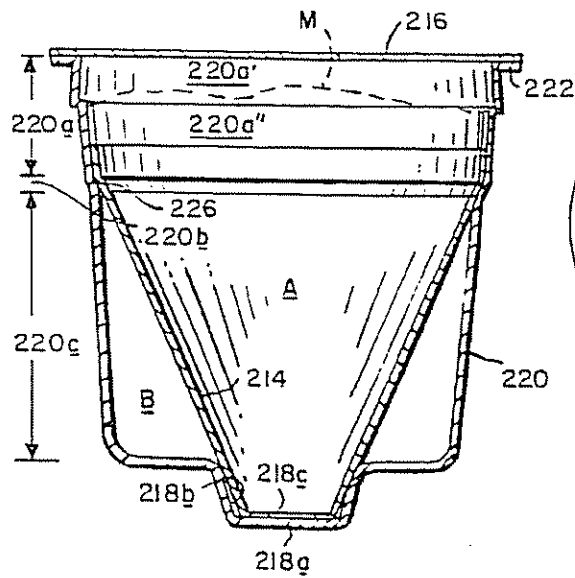


FIG. 12

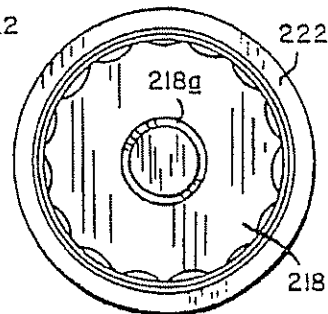


FIG. 11

U.S. Patent

Nov. 11, 2003

Sheet 4 of 5

US 6,645,537 B2

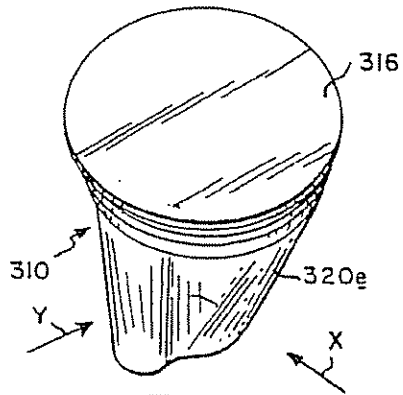


FIG. 13

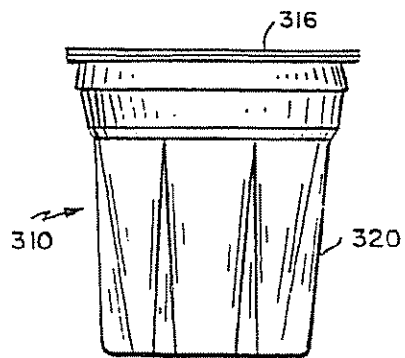


FIG. 15

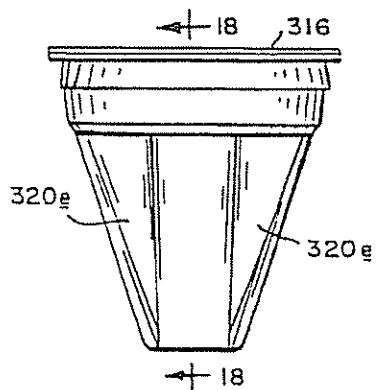


FIG. 16

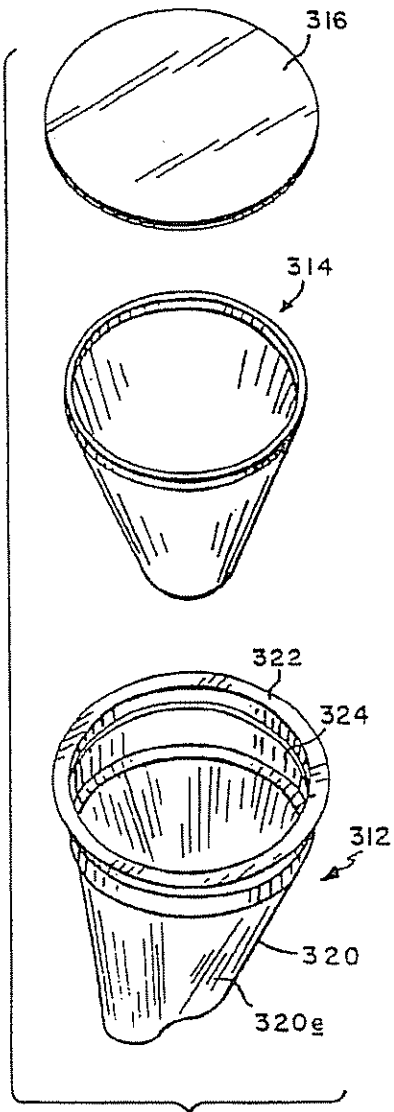


FIG. 14

U.S. Patent

Nov. 11, 2003

Sheet 5 of 5

US 6,645,537 B2

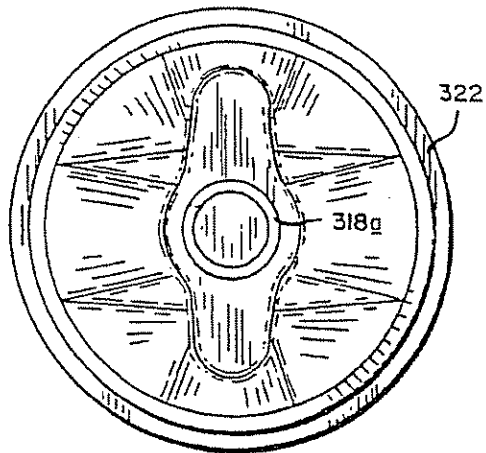


FIG. 17

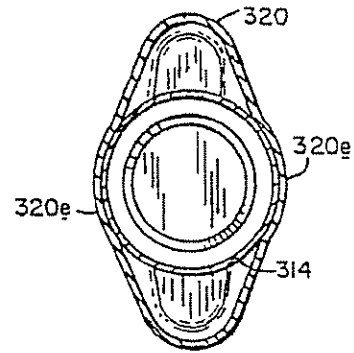


FIG. 20

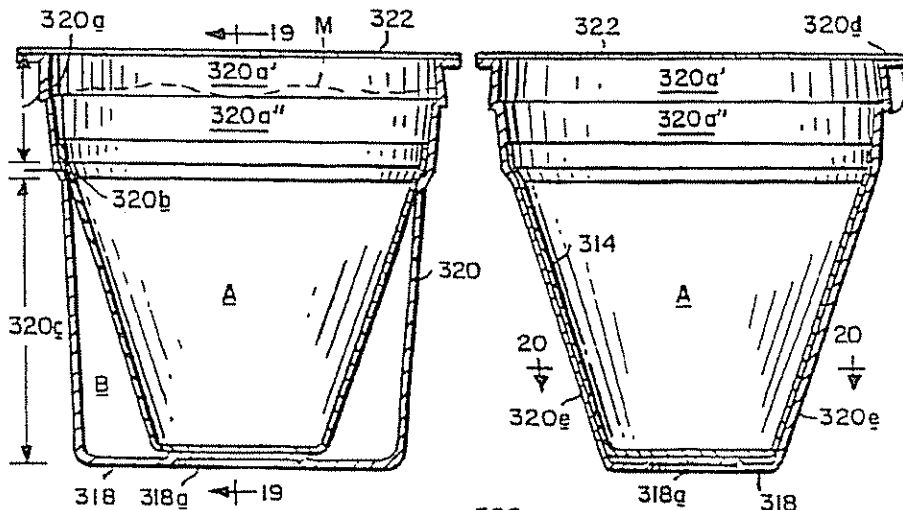
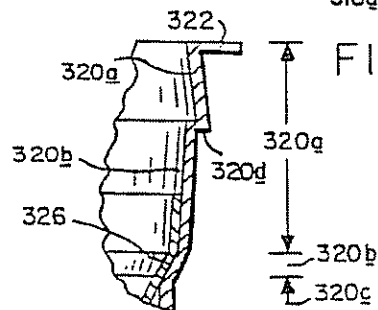


FIG. 18

FIG. 19

FIG. 21



US 6,645,537 B2

1

BEVERAGE FILTER CARTRIDGE**CROSS REFERENCE TO RELATED APPLICATIONS**

This application claims priority from Provisional Patent Application Ser. No. 60/183,708 filed Feb. 18, 2000.

FIELD OF THE INVENTION

This invention relates to disposable single serve beverage filter cartridges.

DESCRIPTION OF THE PRIOR ART

A known disposable single serve beverage filter cartridge is disclosed in U.S. Pat. Nos. 5,325,765 and 5,840,189 (Sylvan et al.), dated respectively Jul. 5, 1994 and Nov. 24, 1998, the disclosures of which are herein incorporated by reference.

This beverage filter cartridge is comprised basically of an impermeable yieldably-piercable cup-shaped outer container internally subdivided by a permeable cone-shaped filter into first and second chambers. A granular or powdered dry beverage medium, e.g., roasted ground coffee, is stored in the first chamber, and the container is closed by an impermeable yieldably piercable lid.

During a processing cycle, the lid and container bottom are pierced, respectively, by tubular inlet and outlet probes. The inlet probe admits heated liquid under pressure into the first chamber for infusion with the beverage medium, and the resulting brewed beverage passes through the filter into the second chamber from which it exits via the outlet probe for delivery to an underlying cup.

This known beverage filter cartridge has gained rapid and increasingly widespread acceptance, notwithstanding several problems that have persisted since its initial introduction. One such problem stems from a tendency of the container side wall to buckle under the force exerted by the outlet probe as it pierces the container bottom. This sometimes results in a failure of the outlet probe to achieve bottom penetration, thus aborting the brewing process because the brewed beverage cannot be delivered to the underlying cup. Buckling of the container side wall also can distort the punctured orifice in the container bottom, thus compromising sealing and resulting in leakage of the brewed beverage.

Problems have also been encountered in reliably sealing the rim of the filter component to the interior side wall of the container, as well as in centrally securing the bottom of the filter component to the container bottom. Failure to achieve a proper rim seal can cause the unsealed portion of the filter to collapse under brew pressure, resulting in the brewed beverage being contaminated by beverage medium residue escaping from the collapsed filter. By the same token, contamination of the brewed beverage also can occur if the filter bottom is not centrally secured, resulting in the filter being punctured by the outlet probe as it projects upwardly through the container bottom. Contamination of the brewed beverage also occurs occasionally when a filter element bursts under the pressure exerted by the heated liquid being infused with the beverage medium.

Still another problem stems from heat sealing the upper rim of the filter at or closely adjacent to the upper rim of the container side wall. This increases the unoccupied so called "head space" between the outside of the filter and the surrounding container wall, and also limits the maximum amount of beverage medium that can be stored in the

2

cartridge to that which can be contained within the filter. In some cases, this can compromise the strength of the resulting brewed beverage. Beverage strength can be optimized by filling the filter to its maximum capacity, but this can result in errant granules of the beverage medium spilling onto the container rim. This in turn can disrupt the integrity of the seal between the cover and the container rim.

Among the objectives of the present invention is a strengthening of the container side wall to thereby resist buckling when the container bottom is punctured by the outlet probe of the brewer.

Companion objectives include a beneficial increase in beverage medium storage capacity, improvements in the manner in which the filter component is sealed to and radially supported by the container side wall, as well as improvements in the manner in which the lower end of the filter is positioned and anchored to the cartridge bottom.

SUMMARY OF THE INVENTION

In accordance with the present invention, the container side wall is provided with circumferentially spaced flutes which are strategically positioned to enhance resistance to buckling without interfering with or compromising the integrity of the seal between the side wall and the filter component. The location at which the filter component is joined to the interior side wall of the container is lowered to achieve a beneficial increase in beverage medium storage capacity. This location is defined by a tapered circular ledge against which the tapered filter component is reliably sealed.

The channels formed between the circumferentially spaced flutes serve to efficiently direct the brewed beverage downwardly towards the pierced container bottom, with an accompanying beneficial increase in turbulence in the head space defined between the filter element and container side wall.

In a second embodiment of the invention, the container bottom is configured to provide a downwardly protruding centrally disposed boss defining a reduced diameter interior sump surrounded by an annular planar bottom area. The annular bottom area is available for piercing by the outlet probe. The filter projects downwardly into and is secured within the sump at a location safely out of harms way with respect to the piercing action of the outlet probe. A beneficial decrease in head space is also realized by locating the lower end of the filter in the reduced diameter sump.

In a third embodiment of the present invention, the circumferentially spaced flutes protrude sufficiently inwardly into the container interior to radially contact the filter element at circumferentially spaced locations. This radial contact beneficially guides the filter element into its centrally located position during assembly of the cartridge components, and, during the processing cycle, provides radial support which resists distortion and possible bursting of the filter element.

These and other features, objectives and advantages of the present invention will now be described in greater detail with reference to the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a disposable beverage filter cartridge in accordance with one embodiment of the present invention;

FIG. 2 is an exploded perspective view of the basic components of the beverage filter cartridge shown in FIG. 1;

FIG. 3 is a side elevational view of the beverage filter cartridge shown in FIG. 1;

US 6,645,537 B2

3

FIGS. 4 and 5 are vertical and horizontal sectional views taken, respectively, on lines 4—4 and 5—5 of FIG. 3;

FIG. 6 is an enlarged sectional view of a rim portion of the filter cartridge as shown in FIG. 4;

FIG. 7 is an enlarged view of a portion of the side wall of the beverage cartridge;

FIG. 8 is a sectional view taken along line 8—8 of FIG. 7;

FIG. 9 is a bottom perspective view of a disposable filter cartridge in accordance with a second embodiment of the present invention;

FIG. 10 is a side elevational view of the filter cartridge shown in FIG. 9;

FIG. 11 is a bottom view of the filter cartridge shown in FIGS. 9 and 10;

FIG. 12 is an enlarged cross sectional view taken along line 12—12 of FIG. 10;

FIG. 13 is a perspective view of a disposable beverage filter cartridge in accordance with a third embodiment of the present invention;

FIG. 14 is an exploded perspective view of the components of the beverage filter cartridge shown in FIG. 13;

FIG. 15 is a side elevational view looking in the direction depicted by the arrow "X" in FIG. 13;

FIG. 16 is another side elevational view looking in the direction depicted by the arrow "Y" in FIG. 13;

FIG. 17 is an enlarged bottom view of the beverage filter cartridge shown in FIGS. 13–16;

FIG. 18 is an enlarged vertical sectional view taken along line 18—18 of FIG. 16;

FIG. 19 is a vertical sectional view taken along line 19—19 of FIG. 18;

FIG. 20 is a horizontal sectional view taken along line 20—20 of FIG. 19; and

FIG. 21 is an enlarged sectional view of a rim portion of the cartridge as shown in FIGS. 18 and 19.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

With reference initially to FIGS. 1–5, a beverage filter cartridge in accordance with a first embodiment of the invention is generally depicted at 10. As shown in FIG. 2, the basic components of the beverage filter cartridge include an outer cup-shaped container 12, a generally cone-shaped filter element 14, and a planar circular lid 16.

The cup-shaped container 12 has a bottom 18, and a side wall 20 extending upwardly from the bottom to a circular rim 22 surrounding an upper opening 24. With reference additionally to FIGS. 6–8, it will be seen that the side wall 20 has an upper section 20a extending downwardly from the rim 22 to an intermediate section defined by an inwardly tapered ledge 20b, and a lower tapered section 20c extending downwardly from ledge 20b to the bottom 18.

The upper wall section 20a is preferably subdivided into upper and lower segments 20a' and 20a". Moving down the cup, segment 20a' is flared outwardly, and segment 20a" tapers inwardly, with the juncture therebetween defining a stacking shoulder 20d. The bottom 18 is optionally and preferably provided with an upwardly protruding central boss 18a.

The lower tapered wall section 20c is configured to provide a plurality of circumferentially spaced flutes 20e, the upper ends of which terminate beneath the intermediate

4

section defined by ledge 20b, and the lower ends of which terminate as indentations in the bottom wall 18.

It will be seen from FIG. 8 that the depths "d" of the flutes 20e gradually increase from a minimum at their upper ends to a maximum at their lower ends. Likewise, as can be seen from FIG. 7, the widths "w" of the flutes also gradually increase from a minimum at their upper ends to a maximum at their lower ends.

The cup-shaped container is preferably thermo-formed vacuum molded from an impermeable yieldably pierceable heat sealable material having a nominal thickness of 0.031" and comprising, for example, polyethylene/EVOH/polystyrene supplied by Curwood Packaging of Oshkosh, Wis., U.S.A.

The filter element 14 is formed of a pliable and permeable heat sealable material such as for example cellulose polypropylene supplied by J. R. Crompton, Ltd of Bury, Lancashire, England. The bottom of the filter element is supported on and secured as by heat sealing to the central boss 18a.

The lid may be cut or blanked from any suitable impermeable heat sealable and yieldably pierceable material, such as for example, a metallic/polymer laminate supplied by Winpak Heat Seal Packaging, Inc. of Montreal, Canada.

As can best be seen in FIG. 6, the filter element is heat sealed as at 26 to the intermediate wall section defined by tapered ledge 20b. The taper angle of the ledge 20b closely approximates the taper angle of the filter element 14, thereby facilitating the task of securely and reliably heat sealing the two together. The filter element serves to subdivide the interior of the container 12 into first and second chambers A, B. A dry granular or powdered beverage medium "M", typically ground roasted coffee, is stored in chamber A, and the container opening 24 is closed by heat sealing the lid 16 to the rim 22.

At the onset of a processing cycle, the lid 16 and container bottom 18 are pierced, respectively, by tubular inlet and outlet probes 28, 30 (see FIG. 3). The inlet probe 28 admits a heated liquid, typically hot water, into chamber A where it infuses and combines with the beverage medium M to produce a beverage. The beverage passes through the filter element 14 into chamber B, from which it exits via outlet probe 30.

The second embodiment illustrated in FIGS. 9–11 is similar in many respects to the above-described first embodiment. Similar features of the second embodiment have been identified with similar reference numerals in a two hundred series. Thus, for example, reference numeral 10 identifies the filter cartridge of the first embodiment, and reference numeral 210 identifies the filter cartridge of the second embodiment.

In the second embodiment, the container bottom 218 is configured to provide a downwardly protruding centrally disposed reduced diameter boss 218a defining an interior sump 218b surrounded by an annular substantially planar bottom area. The bottom of the conical filter element is received in and secured to the bottom of the sump as at 218c.

The third embodiment illustrated in FIGS. 13–21 is also similar in many respects to the first embodiment. Again, similar features have been identified with similar reference numerals, but in a three hundred series.

The major difference between the first and third embodiments is that the latter has fewer and much deeper flutes 320e. As can be best seen in FIG. 19, the deeper flutes 320e contact and provide radial support for the filter element 314.

In light of the foregoing, it will now be appreciated by those skilled in the art that the present invention offers

US 6,645,537 B2

5

significant advantages over the known beverage filter cartridge described in the previously referenced patents. For example, the circumferentially spaced flutes 20e, 220e and 320e strengthen the container side wall against buckling when the bottom is pierced by the outlet probe 30. The deeper flutes 320e of the third embodiment offer the added advantage of radially supporting the filter element, which can be particularly beneficial during the processing cycle, when the filter element is being stressed by the infusion of pressurized heated liquid into the beverage medium.

In all embodiments, the downwardly diverging and gradually deepening of the flutes serves to promote downward flow of the brewed beverage in chamber B while beneficially encouraging turbulence. The upwardly protruding bosses 18a, 318a on the container bottoms of the first and third embodiments provide readily accessible support platforms for the bottoms of the filter elements. Securing the bottoms of the filter elements to the bosses 18a, 218a insures that the filter elements will not be punctured by the outlet probe 30.

The small diameter sump 218b defined by the downwardly protruding boss 218a of the second embodiment receives the lower end of the filter component in a confined space which beneficially decreases head space and further assists in positively locating and safeguarding the filter from damaging contact with the outlet probe.

The tapered ledges 20b, 220b, 320b of all embodiments provide distinct and readily accessible lands to which the filter elements may be reliably joined by heat sealing. The upper ends of the flutes 20e, 220e, 320e terminate below the ledges 20b, 220b, 320b, thereby insuring that the ledges are not interrupted by discontinuities that would be detrimental to the critical seal of the filter elements to the container side walls.

The upper container sections 20a, 220a, 320a above the filters provide beneficial increases in available storage capacity for the beverage medium. This increased storage capacity makes it unnecessary to fill the interior chamber A to its maximum capacity, thereby safeguarding the container rim from contamination by errant granules of the beverage medium.

Although the outer container and cover have been described as being formed from impermeable materials, it will be understood by those skilled in the art that, alternatively, permeable materials may be employed for one or both of these components. Where permeable materials are employed, the completed cartridges will preferably be subsequently enclosed, either individually or in batches, with impermeable wrappings. Materials for such wrappings are well known, and include for example EVOH films, aluminum foil, etc.

Although the present invention has been described with reference to several embodiments, various changes, modifications and additions may be made without departing from the spirit and scope of the appended claims.

6

We claim:

1. A beverage filter cartridge comprising:

a cup-shaped outer container having a bottom wall and a side wall extending from said bottom wall to a circular rim surrounding an upper opening, said side wall having an upper section extending downwardly from said rim to an inwardly tapered ledge, and having a tapered lower section extending downwardly from said inwardly tapered ledge to said bottom wall;

a generally cone shaped filter element received in said container, said filter element having a closed lower end supported on and secured to said bottom wall, and having an upwardly diverging wall with an open upper end supported on and secured to said inwardly tapered ledge, said filter element being configured and positioned to subdivide the interior of said container into first and second chambers;

a beverage medium stored in said first chamber; and

a cover joined to said side wall at said rim and closing said upper opening, said cover being pierceable to accommodate an injection of liquid into said first chamber for combination with said beverage medium to produce a beverage, said filter element being permeable to accommodate a flow of said beverage from said first chamber into said second chamber, and said bottom wall being pierceable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

2. The beverage filter cartridge of claim 1 wherein the taper angle of said ledge is greater than the taper angle of said lower section.

3. The beverage filter cartridge of claim 1 wherein said upper section has an upper segment extending downwardly from said circular rim and a lower segment extending upwardly from said ledge, said upper segment being flared outwardly and said lower segment being tapered inwardly, with the juncture of said upper and lower segments defining an exterior stacking shoulder.

4. The beverage filter cartridge of any one of claims 1-3 wherein the taper angle of said ledge approximates the taper angle of said filter element.

5. The beverage filter cartridge of claim 1 wherein said outer container is impermeable to liquids and gases.

6. The beverage filter cartridge of claim 1 wherein said lid is impermeable to liquids and gases.

7. The beverage filter cartridge of claim 1 wherein said bottom wall is provided with an upwardly protruding centrally disposed boss, the lower end of said filter element being supported on said boss.

8. The beverage filter cartridge of claim 7 wherein the lower end of said filter is secured to said boss.

* * * * *



US006589577B2

(12) **United States Patent**
Lazaris et al.

(10) Patent No.: **US 6,589,577 B2**
(45) Date of Patent: **Jul. 8, 2003**

(54) **DISPOSABLE SINGLE SERVE BEVERAGE
FILTER CARTRIDGE**

FOREIGN PATENT DOCUMENTS

(75) Inventors: Nicholas G. Lazaris, Newton, MA
(US); William P. Bucuzzo, Haverhill,
MA (US)

DE	8609418	5/1986
EP	1101430 A1	5/2001
FR	2118368	7/1972
GB	1427375	3/1976
GB	2023086 A	12/1979
NL	8701627	7/1987

(73) Assignee: Keurig, Inc., Wakefield, MA (US)

* cited by examiner

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 93 days.

Primary Examiner—Keith Hendricks

Assistant Examiner—Drew Becker

(74) Attorney, Agent, or Firm—Samuels, Gauthier &
Stevens

(21) Appl. No.: 09/782,660

(22) Filed: Feb. 13, 2001

(65) **Prior Publication Data**

US 2001/0047724 A1 Dec. 6, 2001

Related U.S. Application Data

(60) Provisional application No. 60/183,606, filed on Feb. 18,
2000.

(51) Int. Cl.⁷ A47G 19/16; B65D 85/816

(52) U.S. Cl. 426/79; 426/113; 426/115;
99/295; 99/323; 206/0.5; 210/455; 210/473

(58) Field of Search 99/295, 316, 317,
99/323, 321, 322; 426/79, 81, 112, 113,
433, 435, 115; 206/0.5; 210/455, 473

(56) **References Cited**

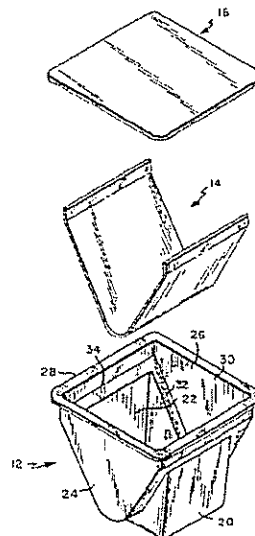
U.S. PATENT DOCUMENTS

4,550,024 A	10/1985	le Granse	426/77
5,075,005 A	12/1991	Brindopke	210/477
5,242,702 A	9/1993	Fond	426/433
5,243,164 A	9/1993	Erickson et al.	219/10.55 E
5,605,710 A	2/1997	Pridonoff et al.	426/86
5,840,189 A	11/1998	Sylvan et al.	210/474

(57) **ABSTRACT**

A beverage filter cartridge includes an outer container with a bottom, and front, back and side walls extending upwardly from the bottom to a peripheral rim surrounding an upper opening. The side wall is contoured to define interior ledges located above the bottom and extending between the front and back walls. A planar filter element having front, back and side edge regions is configured, dimensioned and positioned to subdivide the interior of the container into first and second chambers, with the front and back edge regions of the filter element secured respectively to the front and back walls of the container, and with side edge regions of the filter element secured to respective interior ledges of the container side walls. A beverage medium is stored in the first chamber. A cover is joined to the container rim to close the upper opening. The cover is yieldably pierceable to accommodate an inflow of liquid into the first chamber for combination with the beverage medium to produce a beverage. The filter element is permeable to accommodate passage of the beverage from the first chamber into the second chamber, and the container bottom is yieldably pierceable to accommodate an outflow of the beverage from the second chamber to the exterior of the cartridge.

13 Claims, 3 Drawing Sheets



U.S. Patent

Jul. 8, 2003

Sheet 2 of 3

US 6,589,577 B2

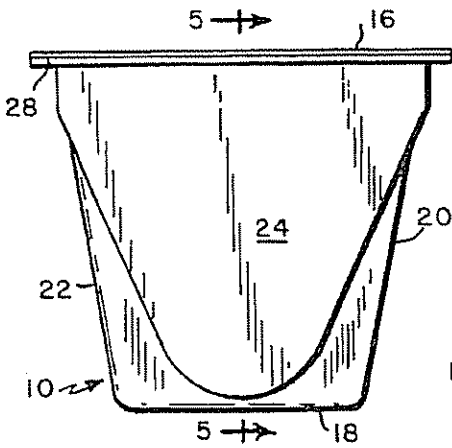


FIG. 3

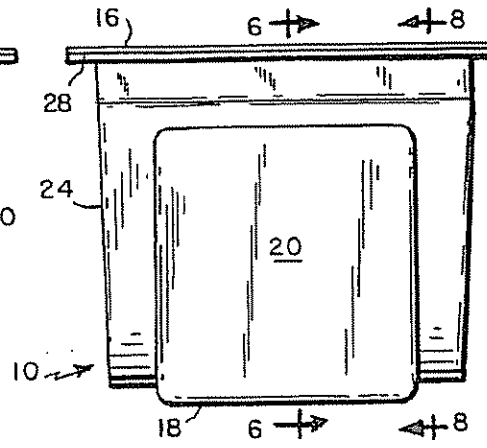


FIG. 4

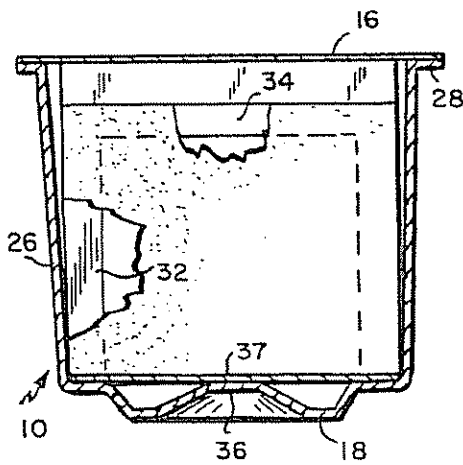


FIG. 5

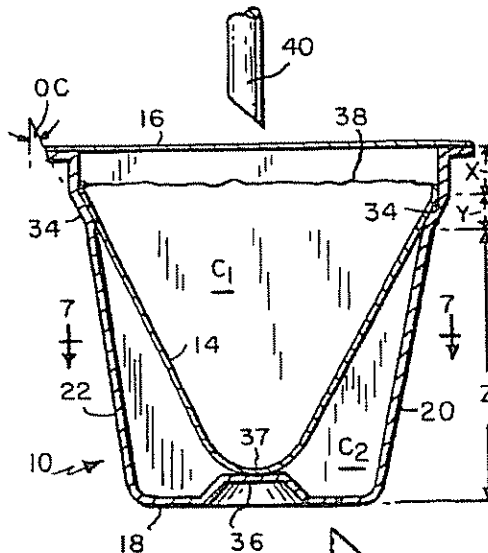


FIG. 6

U.S. Patent

Jul. 8, 2003

Sheet 3 of 3

US 6,589,577 B2

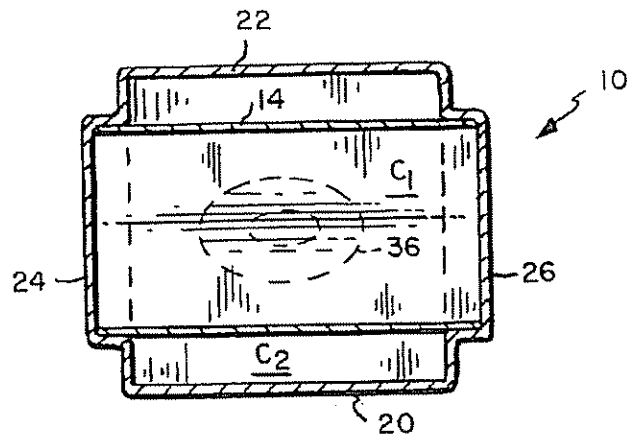


FIG. 7

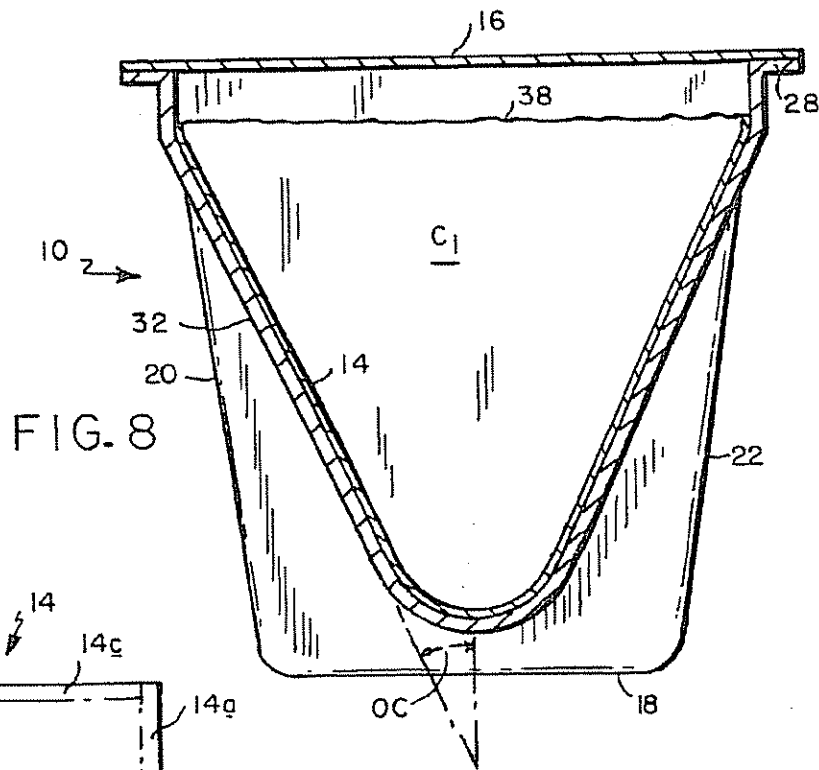


FIG. 8

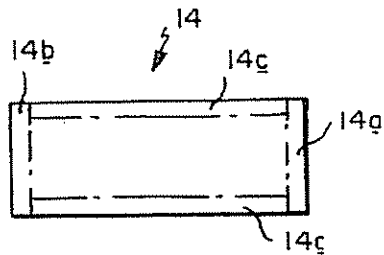


FIG. 9

US 6,589,577 B2

1

DISPOSABLE SINGLE SERVE BEVERAGE FILTER CARTRIDGE

CROSS REFERENCES TO RELATED APPLICATIONS

This application claims priority from Provisional Patent Application Serial No. 60/183,606 filed Feb. 18, 2000.

FIELD OF THE INVENTION

This invention relates to disposable single serve beverage filter cartridges.

DESCRIPTION OF THE PRIOR ART

A known disposable single serve beverage filter cartridge is disclosed in U.S. Pat. Nos. 5,325,765 and 5,840,189 (Sylvan et al), dated respectively Jul. 5, 1994 and Nov. 24, 1998. This beverage filter cartridge is comprised basically of an impermeable yieldably pierceable cup-shaped container internally subdivided by a permeable cone-shaped filter into first and second chambers. A granular or powered dry beverage medium, e.g., roasted ground coffee, is stored in the first chamber, and the container is closed by an impermeable yieldably pierceable lid.

During a brewing cycle, the lid and container bottom are pierced, respectively, by tubular inlet and outlet probes. The inlet probe admits heated liquid into the first chamber for infusion with the beverage medium, and the resulting brewed beverage passes through the filter into the second chamber from which it exits via the outlet probe for delivery to an underlying cup.

This known beverage filter cartridge has gained rapid and increasingly widespread acceptance, notwithstanding certain problems and disadvantages relating to its production and subsequent use that have persisted since its initial introduction.

For example, expensive and mechanically complex production equipment is required both to form the cone-shaped filter from a sheet of filter media, and to insert and secure the thus formed filter cone in the cartridge container. Slight deviations from close tolerances governing these steps can cause the filter to rupture or become dislodged from the container wall during the brewing cycle, resulting in contamination of the brewed beverage with beverage medium residue from the first chamber.

Because of its cone-shaped configuration, the filter has a limited extract storage capacity of less than 60% of the internal volume of the cup-shaped container. The unoccupied volume surrounding the filter component, commonly referred to as "head space", is largely wasted and thus adds disadvantageously to the overall size of the beverage filter cartridge. The additional head space also increases the likelihood of residual oxygen being left in the container, thus adversely affecting product shelf life. The cone-shaped configuration of the filter also limits the area available for lid puncture and inflow of liquid for infusion with the beverage medium.

Also, the side wall of the cup-shaped container is relatively pliable and thus prone to buckling as the brewer probes puncture the container bottom and lid at the onset of the brewing cycle. This can adversely affect the puncturing process, resulting in leakage around the probes.

What is needed, therefore, is an improved beverage filter cartridge which obviates or at least significantly minimizes the above-noted problems and disadvantages.

SUMMARY OF THE INVENTION

In accordance with the present invention, a beverage filter cartridge includes an outer container having a bottom with

2

front, back and side walls extending upwardly to a peripheral rim surrounding an upper opening. The side walls are suitably contoured to minimize headspace, increase rigidity, and to define interior filter-supporting ledges located above the bottom and extending between the front and back walls. A planar filter element subdivides the interior of the container into first and second chambers, with the first chamber having a volumetric storage capacity of at least about 80% of the total internal volume of the outer container. Front and back edge regions of the filter element are secured respectively to the front and back walls of the container, and edge regions of the filter component are likewise secured to the interior ledges of the container side walls.

A beverage medium is stored in the first chamber, and a lid is applied to the peripheral container rim to seal off the upper opening.

The planar filter element is readily formed from a sheet of filter media, and is easily inserted and secured in place. The front and back container walls and the interior ledges of the side walls offer ample support surfaces against which edge regions of the filter element may be reliably secured. The contoured container side walls contribute advantageously to a heightened rigidity which beneficially resists buckling when the lid and container bottom are pierced at the onset of a brewing cycle.

The relatively large volume of the first chamber as compared to the second chamber translates into a more efficient package, making it possible to either increase the amount of beverage medium for a given overall cartridge size, or conversely, for a given amount of beverage medium, to decrease the overall cartridge size.

These and other features and advantages of the present invention will now be described in greater detail with reference to the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a beverage filter cartridge in accordance with the present invention;

FIG. 2 is a larger scale exploded perspective view of the component parts of the beverage filter cartridge;

FIG. 3 is a front elevational view of the beverage filter cartridge, the rear view being a mirror image of this view;

FIG. 4 is a side elevational view of the beverage filter cartridge, the opposite side being a mirror image of this view;

FIG. 5 is a vertical sectional view taken along line 5—5 of FIG. 3;

FIG. 6 is a vertical sectional view taken along line 6—6 of FIG. 4;

FIG. 7 is a horizontal sectional view taken along line 7—7 of FIG. 6;

FIG. 8 is an enlarged sectional view taken along line 8—8 of FIG. 4; and

FIG. 9 is a plan view on a reduced scale of the filter element prior to its insertion in the cup-shaped container.

DETAILED DESCRIPTION

With reference to the drawings, a beverage filter cartridge in accordance with the present invention is generally depicted at 10. The cartridge components are illustrated separately in FIG. 2, and include: an outer container 12, a planar filter element 14, and a lid 16.

The container 10 has a bottom wall 18, a front wall 20, a back wall 22, and side walls 24, 26. The front, back and side

US 6,589,577 B2

3

walls extend upwardly from the bottom wall to a peripheral rim 28 surrounding an upper opening 30.

The side walls 24, 26 are appropriately contoured to define generally V-shaped first ledges 32 extending between the front and back walls 20, 22, with the lower portions of the ledges 32 being spaced above the container bottom 18, and the sides diverging upwardly at an angle α with respect to the vertical, as shown in FIG. 8.

As shown in FIGS. 4 and 6, the front and back walls 20, 22 have upper sections "X", intermediate sections "Y", and lower sections "Z". The intermediate sections Y define second ledges 34 which diverge upwardly at the same angle α to thereby provide continuations of the first ledges 32 extending across the front and back walls 20, 22.

The bottom 18 is preferably contoured to provide an upwardly protruding centrally located boss 36.

The container may be formed from impermeable yieldably pierceable and heat sealable materials, a preferred example being polyethylene/EVOH/polystyrene supplied by Curwood Flexible Packaging of Oshkosh, Wis., USA.

The filter element 14 may be cut or blanked from any suitably pliable and permeable sheet material, a preferred example being cellulose polypropylene supplied by J. P. Crompton, Ltd. of Bury, Lancashire, England.

As shown in FIG. 9, the filter element has front, back and side edge regions 14a, 14b and 14c. The filter element is configured, dimensioned and operatively positioned to subdivide the interior of the container into first and second chambers C_1 , C_2 , with the volume of the first chamber C_1 comprising at least about 80% of the internal volume of the container 12. When thus positioned, it will be understood that the side edge regions 14c of the filter element are secured as by heat sealing to the first ledges 32 of the side walls 24, 26, and the front and back edge regions 14a, 14b are similarly secured to the second ledges 34 of the front and back walls 20, 22. Preferably, the bottom of the filter element is also secured as by heat sealing as at 37 to the upwardly protruding boss 36.

A beverage extract 38 (shown only in FIGS. 6 and 8) is received through the upper opening 30 and stored in the first chamber C_1 . The upper opening is then closed by securing the lid 16, as by heat sealing, to the peripheral container rim 28. The lid may be cut or blanked from any suitable impermeable heat sealable and yieldably pierceable material, a preferred example being a metallic/polymer laminate supplied by Heat Seal-Winpak, Ltd. of Montreal, Canada.

At the onset of a brewing cycle, as shown in FIG. 6, the lid 16 and container bottom 18 are pierced, respectively, by tubular inlet and outlet probes 40, 42. The inlet probe admits heated liquid into the first chamber C_1 for infusion with the beverage medium 38. The resulting brewed beverage passes through the filter element 14 into the second chamber C_2 from which it exits via the outlet probe 42.

In light of the foregoing, it will now be appreciated by those skilled in the art that the present invention offers a number of significant advantages over the known beverage filter cartridge described previously. For example, the planar filter element 14 lends itself to being readily blanked from sheet material and easily configured, inserted and secured in place in the container 12. The container ledges 32 and 34 provide relatively wide and readily accessible surfaces onto which edge regions of the filter element can be securely heat sealed. The large volume of the extract storage chamber C_1 maximizes efficient utilization of the container interior. The contoured side walls 24, 26 lend rigidity to the overall structure and in so doing, resist buckling as the lid and container bottom are pierced by inlet and outlet probes.

4

The cartridge container is designed to maintain a controlled atmosphere of N_2 , C_2 or other gas introduced during the manufacturing process. Once sealed, the container will withstand an induced vacuum of at least 22" Hg for a prescribed period and will remain serviceable and protect the beverage medium contained in the storage chamber C_1 .

Although the outer container and lid have been described as being formed from impermeable materials, it will be understood by those skilled in the art that, alternatively, permeable materials may be employed for one or both of these components. Where permeable materials are employed, the completed cartridges will preferably be subsequently enclosed, either individually or in batches, with impermeable wrappings. Materials for such wrappings are well known, and include for example EVOH films, aluminum foil, etc.

Although the present invention had been shown and described with respect to a preferred embodiment, various changes and modifications that are obvious to a person skilled in the art to which the invention pertains, even if not shown or specifically described herein, are deemed to lie within the spirit and scope of the present invention. Any numbering of the elements of the following claims is merely for convenience and is not intended to suggest that the ordering of the elements of the claims has particular significance other than as otherwise expressed by the language of the claims.

What is claimed is:

1. A beverage filter cartridge comprising:

a) an outer container having a bottom and front, back and side walls extending upwardly from said bottom to a peripheral rim surrounding an upper opening, said side walls being contoured to define interior ledges located above and diverging upwardly from said bottom to extend between said front and back walls;

b) a planar filter element having front, back and side edge regions, said filter element being formed into a generally pocket shaped configuration defining a cavity, and being positioned to subdivide the interior of said container into first and second chambers, with said front and back edge regions secured respectively to said front and back walls, and with said side edge regions secured to respective interior ledges of said side walls, said second chamber being located externally of said first chamber, and said first chamber being at least partially defined by the cavity of said filter element;

c) a beverage medium received in said cavity for storage in said first chamber; and

d) a cover joined to said rim and closing said upper opening, said cover being pierceable to accommodate an inflow of liquid into said first chamber for combination with the beverage medium to produce a beverage, said filter element being permeable to accommodate a flow of said beverage from said first chamber into said second chamber, and said bottom being pierceable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

2. The beverage filter cartridge of claim 1 wherein said interior ledges are generally V-shaped.

3. The beverage filter cartridge of claims 1 or 2 wherein said front and back walls have upper sections extending downwardly from said peripheral rim to intermediate sections, and lower sections extending downwardly from said intermediate sections to said bottom.

4. The beverage filter cartridge of claim 3 wherein said intermediate sections define second ledges joining said upper and lower sections.

US 6,589,577 B2

5

5. The beverage filter cartridge of claim 4 wherein said second ledges taper inwardly from said upper sections to said lower sections.

6. The beverage filter cartridge of claim 3 wherein the front and back edge regions of said filter element are joined respectively to the intermediate sections of said front and back walls.

7. The beverage filter cartridge of claim 1 further comprising a central boss on said bottom, said boss projecting into the interior of said container and into contact with said filter element.

8. The beverage filter cartridge of claim 1 wherein the volume of said first chamber is at least about 80% of the volume of said container.

9. The beverage filter cartridge of claim 1 wherein said outer container is impermeable to liquids and gases.

10. The beverage filter cartridge of claims 1 or 9 wherein said cover is impermeable to liquids and gases.

11. A beverage filter cartridge comprising:

an outer container having a bottom and front, back and side walls extending upwardly from said bottom to a peripheral rim surrounding an upper opening, said side walls being contoured to define interior first ledges located above and diverging upwardly from said bottom to extend between said front and back walls, said first ledges being generally V-shaped and having sides diverging upwardly at an angle α , said front and back walls having upper sections extending downwardly from said peripheral rim to intermediate sections, and lower sections extending downwardly from said intermediate sections to said bottom, said intermediate sections diverging upwardly at said angle α to define second ledges;

a planar filter element having front, back and side edge regions, said filter element being formed into a generally pocket shaped configuration defining a cavity, and being positioned to subdivide the interior of said container into first and second chambers, with said front and back edge regions secured respectively to said second ledges, and with said side edge regions secured to respective first ledges of said side walls, said second chamber being located externally of said first chamber, and said first chamber being at least partially defined by the cavity of said filter element;

a beverage medium received in said cavity for storage in said first chamber; and

a cover joined to said rim and closing said upper opening, said cover being pierceable to accommodate an inflow of liquid into said first chamber for combination with the beverage medium to produce a beverage, said filter element being permeable to accommodate a flow of said beverage from said first chamber into said second chamber, and said bottom being pierceable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

12. A beverage filter cartridge comprising:

an outer container having a bottom and front, back and side walls extending upwardly from said bottom to a peripheral rim surrounding an upper opening, said side walls being contoured to define interior ledges located

6

above and diverging upwardly from said bottom to extend between said front and back walls;

a planar filter element having front, back and side edge regions, said filter element being formed into a generally pocket shaped configuration defining a cavity, and being positioned to subdivide the interior of said container into first and second chambers, the volume of said first chamber being at least about 80% of the volume of said container, the front and back edge regions of said filter element being secured respectively to said front and back walls, and the side edge regions of said filter element being secured to respective interior ledges of said side walls, said second chamber being located externally of said first chamber, and said first chamber being at least partially defined by the cavity of said filter element;

a beverage medium received in said cavity for storage in said first chamber; and

a cover joined to said rim and closing said upper opening, said cover being pierceable to accommodate an inflow of liquid into said first chamber for combination with the beverage medium to produce a beverage, said filter element being permeable to accommodate a flow of said beverage from said first chamber into said second chamber, and said bottom being pierceable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

13. A beverage filter cartridge comprising:

an outer container having a bottom and front, back and side walls extending upwardly from said bottom to a peripheral rim surrounding an upper opening, said side walls being contoured to define interior ledges located above and diverging upwardly from said bottom to extend between said front and back walls, said bottom having a central boss projecting upwardly into the interior of said container;

a planar filter element having front, back and side edge regions, said filter element having a generally pocket shaped configuration forming a cavity and being positioned to subdivide the interior of said container into first and second chambers, with said front and back edge regions secured respectively to said front and back walls, and with said side edge regions secured to respective interior ledges of said side walls, and with a bottom portion of said filter element secured to said boss, said second chamber being located externally of said first chamber, and said first chamber being at least partially defined by the cavity of said filter element;

a beverage medium received in said cavity for storage in said first chamber; and

a cover joined to said rim and closing said upper opening, said cover being pierceable to accommodate an inflow of liquid into said first chamber for combination with the beverage medium to produce a beverage, said filter element being permeable to accommodate a flow of said beverage from said first chamber into said second chamber, and said bottom being pierceable to accommodate an outflow of said beverage from said second chamber to the exterior of said cartridge.

* * * * *



US006606938B2

(12) **United States Patent**
Taylor

(10) Patent No.: **US 6,606,938 B2**
(45) Date of Patent: **Aug. 19, 2003**

(54) **TWO STEP PUNCTURING AND VENTING
OF SINGLE SERVE FILTER CARTRIDGE IN
A BEVERAGE BREWER**

(75) Inventor: Jon Taylor, Groton, MA (US)

(73) Assignee: Keurig, Incorporated, Wakefield, MA
(US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: 10/113,282

(22) Filed: Apr. 1, 2002

(65) **Prior Publication Data**

US 2002/0144603 A1 Oct. 10, 2002

Related U.S. Application Data

(60) Provisional application No. 60/281,952, filed on Apr. 6,
2001.

(51) Int. Cl.⁷ A47J 31/32; A23F 5/00

(52) U.S. Cl. 99/295; 99/302 R; 426/433;
426/77

(58) Field of Search 99/295, 302 R,
99/275; 426/433, 435, 77

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,472,719 A * 12/1995 Favre 426/77
5,773,067 A * 6/1998 Freychet et al. 99/295 X
5,840,189 A 11/1998 Sylvan et al.
6,142,063 A 11/2000 Beaulieu et al.

* cited by examiner

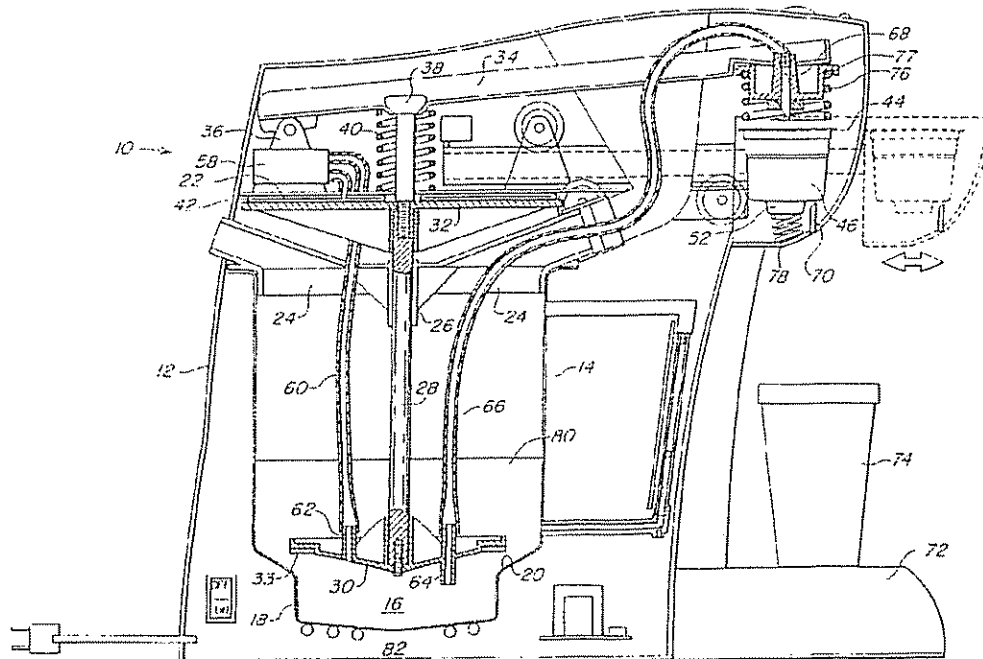
Primary Examiner—Reginald L. Alexander

(74) Attorney, Agent, or Firm—Samuels, Gauthier &
Stevens

(57) **ABSTRACT**

In a method and apparatus for brewing a beverage from a dry
beverage medium contained in a disposable cartridge, the
cartridge is initially pierced and vented by a tubular outlet
probe, and then pierced by a tubular inlet probe. Heated
liquid is admitted to the cartridge interior via the inlet probe
for combination with the beverage medium to produce a
beverage, and the beverage is extracted from the cartridge
via the outlet probe.

8 Claims, 5 Drawing Sheets



U.S. Patent

Aug. 19, 2003

Sheet 1 of 5

US 6,606,938 B2

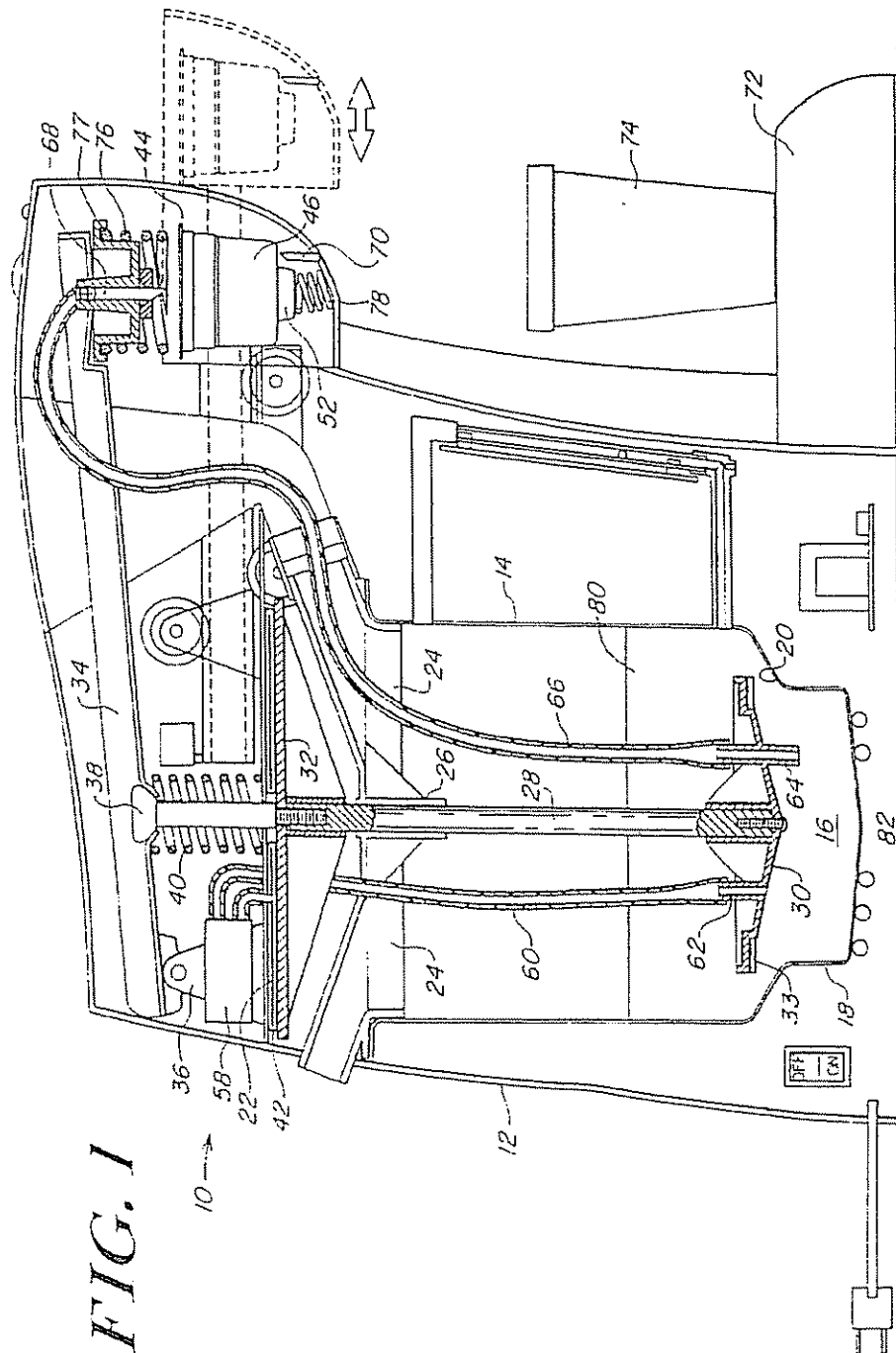


FIG. 1

U.S. Patent

Aug. 19, 2003

Sheet 2 of 5

US 6,606,938 B2

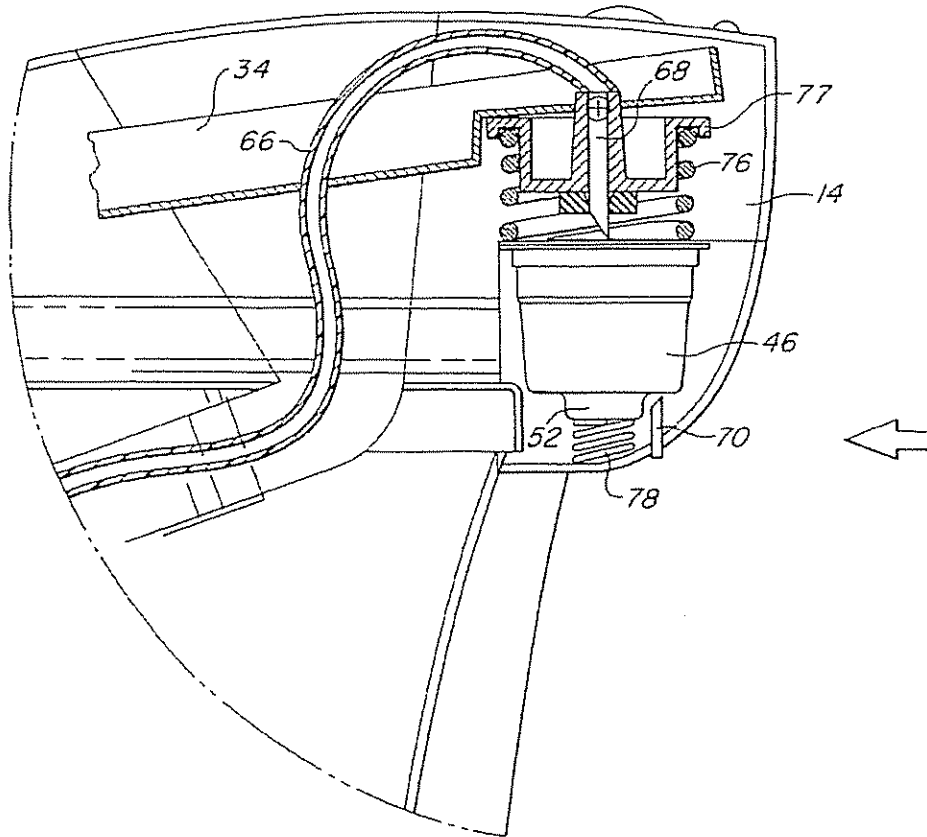


FIG. 2

U.S. Patent

Aug. 19, 2003

Sheet 3 of 5

US 6,606,938 B2

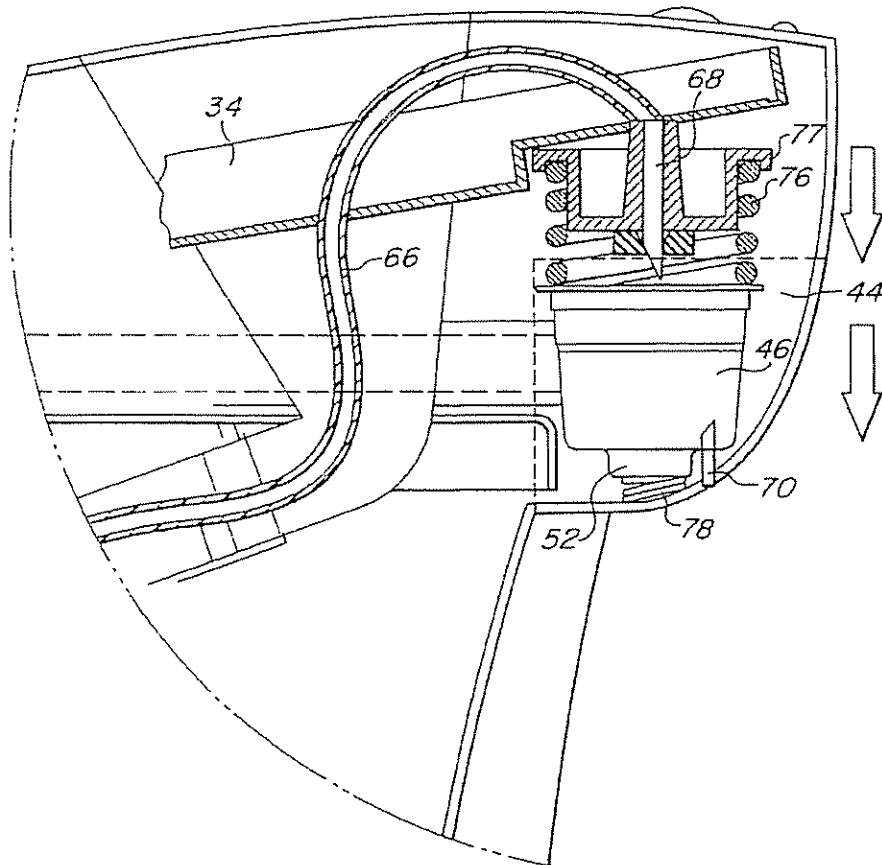


FIG. 3

U.S. Patent

Aug. 19, 2003

Sheet 4 of 5

US 6,606,938 B2

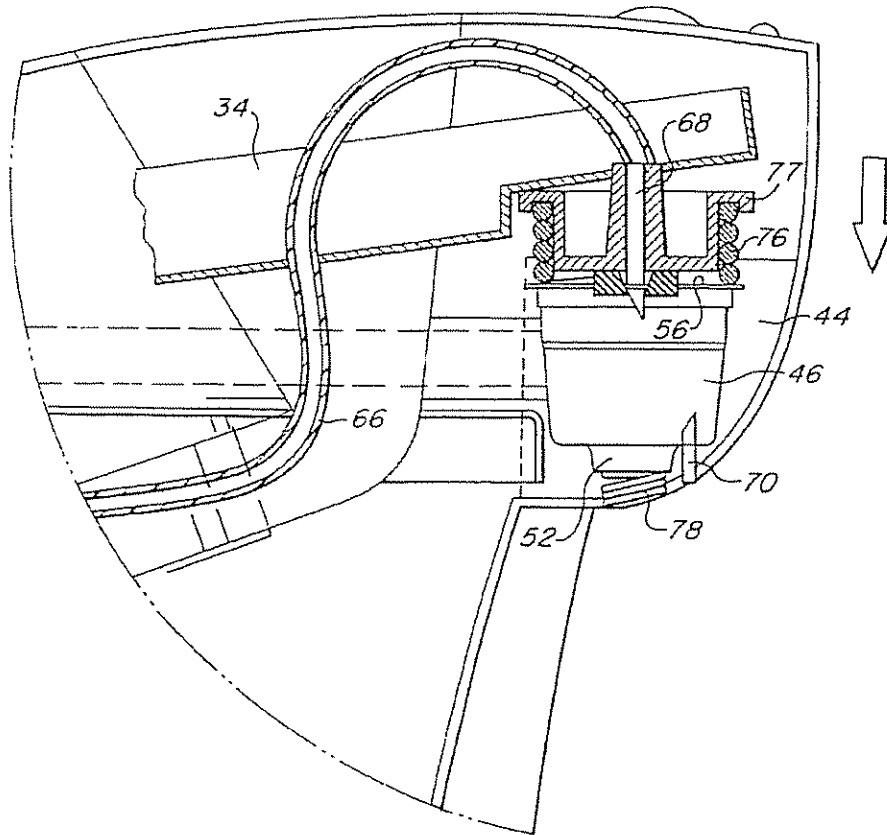


FIG. 4

U.S. Patent

Aug. 19, 2003

Sheet 5 of 5

US 6,606,938 B2

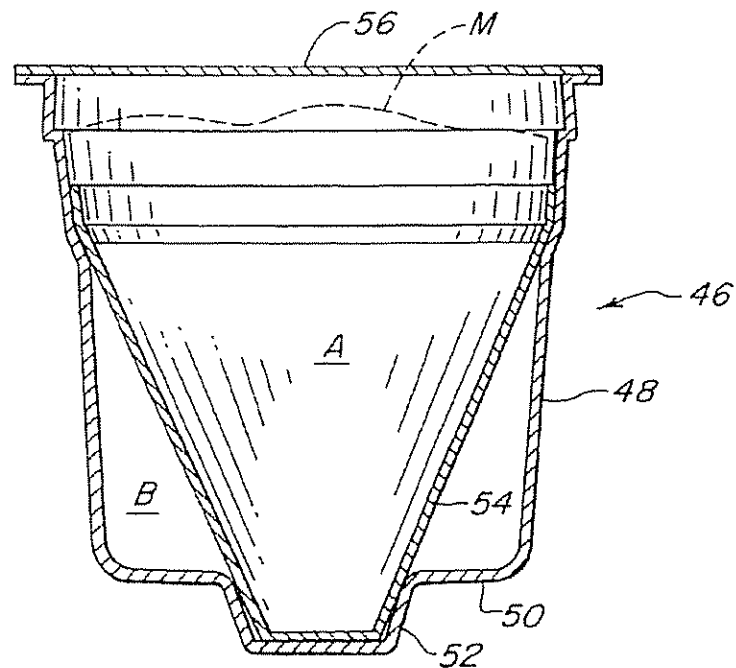


FIG. 5

US 6,606,938 B2

1

TWO STEP PUNCTURING AND VENTING OF SINGLE SERVE FILTER CARTRIDGE IN A BEVERAGE BREWER

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority of provisional patent application Serial No. 60/281,952 filed Apr. 6, 2001.

BACKGROUND DISCUSSION

1. Field of the Invention

This invention relates generally to beverage brewers, and is concerned in particular with an improved system for puncturing and venting single serve beverage filter cartridges utilized in the brew cycles of such brewers.

2. Description of the Prior Art

It is known, as disclosed for example in U.S. Pat. Nos. 5,325,765 (Sylvan et al.) and U.S. Pat. Nos. 5,840,189 (Sylvan et al.) to employ sharpened tubular inlet and outlet probes to puncture the lid and base of a single serve beverage filter cartridge. The inlet probe admits heated liquid into the cartridge for combination with a beverage medium to produce a beverage which then exits the cartridge via the outlet probe. While this arrangement operates in a generally satisfactory manner, experience has indicated that the cartridge interiors occasionally become pressurized as a result of altitude or temperature changes and/or outgassing of the beverage medium. If internal pressures are relieved by venting through the inlet probe, particles of the beverage medium may be entrained with the exiting gas, causing clogging of the inlet probe and a malfunction of the brewer.

SUMMARY OF THE INVENTION

The objective of the present invention is to avoid or at least significantly minimize this problem by first puncturing the cartridge with the outlet probe, followed sequentially with a second puncturing by the inlet probe. In this manner, the cartridge is initially vented through the outlet probe, which then will be flushed clean by the exiting beverage flow.

These and other features and objectives of the present invention will now be described in greater detail with reference to the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view taken through a single serve brewer having a liquid dispensing system embodying the concepts of the present invention, with the dispensing system shown in a "ready" state prior to commencement of a brew cycle;

FIGS. 2-4 are views of the brewing chamber showing successive steps in the brew cycle, including the sequential puncturing sequence of the present invention; and

FIG. 5 is a vertical sectional view through a single serve beverage filter cartridge of the type used with the brewer shown in FIG. 1.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

With reference initially to FIG. 1, a single serve brewer 10 includes a housing 12 containing a liquid storage tank 14. The tank has a lower metering chamber 16 formed by a reduced diameter cup-shaped bottom 18 integrally joined to the larger diameter tank side wall at a circular sealing surface defining a seat 20.

2

A fixed internal structure includes a horizontal platform 22 and struts 24 supporting a vertically disposed sleeve bearing 26 aligned centrally with respect to the tank 14 and its cup-shaped bottom 18.

A vertically reciprocal shaft 28 extends through the sleeve bearing 26. The shaft carries a generally conically shaped baffle 30 at its lower end, and a circular plate 32 disposed beneath the platform 22. A resilient and compressible circular gasket 33 on the lower surface of the baffle overlies the seat 20.

An arm 34 is pivotally mounted on a bracket 36 carried by the platform 22. Arm 34 is connected to the shaft 28 by a pin 38. A coiled spring 40 surrounds the pin 38 between the arm 34 and the upper surface of platform 22, and an inflatable bladder 42 is positioned between the bottom surface of the platform 22 and the plate 32.

The distal end of arm 34 extends into a brewing chamber 44 designed to accept a single serve beverage filter cartridge 46 of the type described in copending patent application Ser. No. 09/782,622 filed Feb. 13, 2001, the description of which is herein incorporated by reference in its entirety.

An air pump 58 on platform 22 is connected to the bladder 42, and is also connected via a flexible hose 60 to a port 62 in the baffle 30. A metering tube 64 extends through the baffle 30 into the chamber 16. The metering tube 64 is connected via a second flexible hose 66 to a depending tubular inlet probe 68 carried by the arm 34. A second tubular outlet probe 70 underlies the cartridge 46 and opens downwardly above an exterior shelf 72 configured and dimensioned to support a cup 74 or other like receptacle.

As shown in FIG. 5, the beverage filter cartridge 46 includes a cup-shaped container 48 having a bottom 50 configured with a depending reduced diameter well 52. The interior of the container is subdivided by a cone-shaped permeable filter 54 into first and second chambers A, B. The bottom of the filter is received in and fixed to the bottom of the well 52. A dry beverage medium "M", typically ground roasted coffee, is stored in the chamber A, after which oxygen is purged from the container interior by the introduction of an inert gas, typically nitrogen. The top of the container is then closed by a lid 56. Both the container and the lid are formed of impermeable yieldably pierceable materials.

When the cartridge 46 is located in the brewing chamber 44, inlet probe 68 is above and aligned with chamber A, and outlet probe 70 is offset from well 52 and aligned beneath chamber B. A helical spring 76 surrounds the inlet probe 68. Spring 76 underlies a platen 77 carried on the distal end of arm 34. A second helical spring 78 underlies the depending cartridge well 52. Spring 78 has a resistance to compression that is lower than that of spring 76.

The tank 14 stores a supply of water 80 heated by an electrical heating element 82 underlying the cup-shaped bottom 18.

During a brew cycle, a control system including appropriate valves and circuitry (not shown) operates the air pump 58 to pneumatically effect the following sequence:

a) The bladder 42 is inflated, pushing shaft 28 and baffle 30 downwardly, until the gasket 33 is pressed against the seat 20 to seal off the water in the metering chamber 16 from the remainder of the tank 14. Downward movement of the shaft 28 also produces downward pivotal movement of arm 34 against the resistance of the spring 40.

b) As shown in FIG. 3, during the initial stage of downward pivotal movement of arm 34, platen 77, spring 76

US 6,606,938 B2

3

and probe 68 move downwardly in concert. Spring 76 resists compression, while spring 78 becomes compressed. The cartridge 46 is thus pressed downwardly, causing the cartridge bottom 50 to be pierced by the underlying exit probe 70. The interior of the cartridge is thus vented via probe 70, resulting in its internal pressure being equalized to that the surrounding atmosphere.

c) As shown in FIG. 4, during the final stage of downward pivotal movement of arm 34, spring 76 is axially compressed between the platen 77 and the container lid 56, resulting in the lid being pierced by probe 68. The probes 68, 70 are now in communication, respectively, with chambers A and B of the cartridge 46.

d) Compressed air is then fed into the metering chamber 16 via hose 60, causing a metered amount of heated water to be expelled and fed to the cartridge 46 via hose 66 and the tubular probe 68. The heated water infuses the beverage medium M in chamber A to produce a brewed beverage. The beverage passes through the filter 54 into chamber B, from which it exits via probe 70 and is received in the underlying cup 74.

e) At the conclusion of the brewing cycle, the pump 56 is deactivated and the system is vented and returned to the condition shown in FIG. 1. The bladder 42 is collapsed, allowing an upward displacement of the shaft 28 and arm 34 under the combined return force of springs 40, 76 and 78. The baffle 30 is thus raised above the seat 20, allowing air in the chamber 16 to be displaced by water in the tank 14. Upward pivotal movement of arm 34 results in extraction of probe 68 and expansion of spring 78 raises the cartridge to its original position, resulting in extraction of the exit probe 70. The spent cartridge 46 may then be removed from the brew chamber 44, readying the system for the next cycle.

Various modifications may be made to the embodiment herein disclosed. For example, in certain circumstances, it may be desirable to omit the second spring 78, in which case the cartridge will remain impaled on and will require manual removal from the exit probe 70 at the conclusion of the brew cycle. The force required to compress spring 76 will be selected to insure that the cartridge is initially pierced by and safely vented through exit probe 70. Another modification might entail fixing the inlet probe 68 and spring 76, and vertically shifting the exit probe 70 and spring 78 to elevate rather than lower the cartridge, resulting in the cartridge again being initially pierced by the exit probe, followed by piercing of the lid by the inlet probe.

Still another modification might be to fix the cartridge in place, and independently operate the probes to effect the desired sequential piercing by the exit and inlet probes. Also, instead of a single air pump 58, two pumps might be employed, one to inflate the bladder 42 and the other to pressurize the metering chamber 16.

It is my intention to cover these and any other changes or modifications that do not depart from the spirit and scope of the invention encompassed by the claims appended hereto.

4

I claim:

1. In a single serve beverage brewer wherein a beverage medium is contained in a disposable cartridge having a yieldably pierceable lid and base, and wherein the cartridge lid is pierced by a tubular inlet probe through which heated liquid is admitted into the cartridge interior for combination with the beverage medium to produce a beverage, and the cartridge base is pierced by a tubular outlet probe through which the beverage is extracted from the cartridge, the improvement comprising:

a brewing chamber structured and dimensioned to removably retain said cartridge between and spaced from both said inlet and outlet probes;

a platen carrying said inlet probe;

means for shifting said platen between a raised position at which said inlet probe is spaced from the cartridge lid, and a lowered position at which said inlet probe has pierced said lid, and

resilient means responsive to movement of said platen from said raised position to said lowered position for urging said cartridge towards said outlet probe to effect piercing of the cartridge base by said outlet probe prior to the cartridge lid being pierced by said inlet probe.

2. The single serve beverage brewer of claim 1 wherein said resilient means is carried by said platen and arranged to contact the cartridge lid.

3. The single serve beverage brewer of claims 1 or 2 wherein said resilient means comprises a coiled spring surrounding said inlet probe.

4. The single serve beverage brewer of claim 3 wherein further comprising a second spring positioned to yieldably resist movement of said cartridge towards said outlet probe.

5. The single serve beverage brewer of claim 4 wherein said second spring has a resistance to compression that is lower than the resistance to compression of said first mentioned spring.

6. A method of brewing a beverage from a beverage medium contained in a disposable cartridge, comprising the following steps, in sequence:

(a) piercing the cartridge with a tubular outlet probe to vent the cartridge interior;

(b) piercing the cartridge with a tubular inlet probe;

(c) admitting heated liquid into the cartridge interior via the inlet probe for combination with the beverage medium to produce a beverage; and

(d) extracting the beverage from the cartridge interior via the outlet probe.

7. The method of claim 6 wherein step (a) is achieved by resiliently urging the cartridge against the outlet probe.

8. The method of claim 7 wherein the cartridge is resiliently urged against the outlet probe in response to movement of the inlet probe towards the cartridge.

* * * * *



US005826492A

United States Patent [19]

Fond et al.

[11] **Patent Number:** **5,826,492**[45] **Date of Patent:** ***Oct. 27, 1998**[54] **APPARATUS FOR EXTRACTING A
SUBSTANCE CONTAINED IN A SACHET**[75] **Inventors:** Olivier Fond, Yverdon; Gérard
Lavanchy, Prilly; Jean-Pierre Pleisch;
Jacques Schaeffer, both of Chardonne;
Alfred Yoakim, La Tour-de-Peilz, all of
Switzerland[73] **Assignee:** Nestec S.A., Vevey, Switzerland[*] **Notice:** The term of this patent shall not extend
beyond the expiration date of Pat. No.
5,649,472.[21] **Appl. No.:** 608,662[22] **Filed:** Feb. 29, 1996**Related U.S. Application Data**[63] **Continuation of Ser. No. 178,325, Jan. 11, 1994, Pat. No.**
5,649,472.[30] **Foreign Application Priority Data**

Jul. 20, 1992 [EP] European Pat. Off. 92112364

[51] **Int. Cl.⁶** **A47J 31/00**[52] **U.S. Cl.** **99/295; 99/302 R; 99/307;
99/316**[58] **Field of Search** **99/295, 302 R,
99/307, 316**[56] **References Cited****U.S. PATENT DOCUMENTS**

3,209,676 10/1965 Zimmermann et al. 99/295
 3,295,998 1/1967 Gores .
 3,403,617 10/1968 Lampe .
 3,407,812 10/1968 Levinson .
 3,607,297 9/1971 Fasano .
 4,429,623 2/1984 Illy .
 4,806,375 2/1989 Favre .

4,846,052 7/1989 Favre et al. .
 5,012,629 5/1991 Behman et al. .
 5,327,815 7/1994 Fond et al. 99/295
 5,343,799 9/1994 Fond .
 5,398,595 3/1995 Fond et al. .
 5,398,596 3/1995 Fond .
 5,472,719 12/1995 Favre 99/295

FOREIGN PATENT DOCUMENTS

6174 1/1980 European Pat. Off. .
 0272432 6/1988 European Pat. Off. .
 636311 5/1983 Switzerland .

OTHER PUBLICATIONS

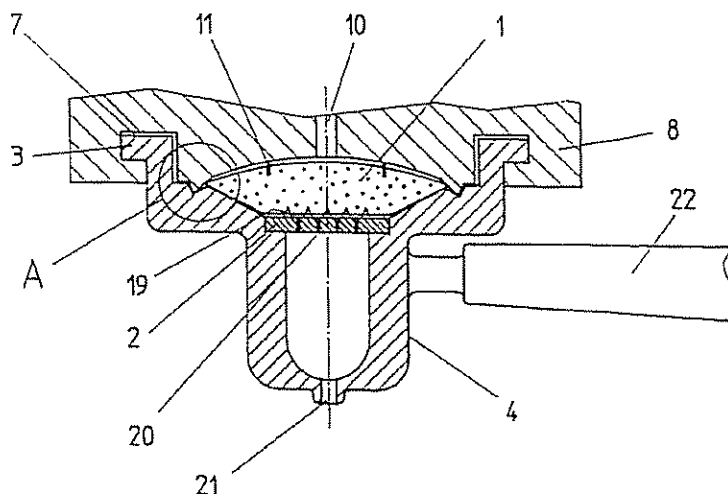
Fond, et al., U.S.S.N. 07/880,173 (effective 1992) to be
 issued as U.S. Patent No. 5,402,707 on Apr. 4, 1995.

Primary Examiner—Anthony J. Weier

[57] **ABSTRACT**

An apparatus for extracting a substance contained in a sachet for preparation of a beverage has a first member having raised and hollow portions for forming a flow zone and a second member for cooperating with the first member to form a chamber to contain the sachet for extraction of the substance and to grip the edge of the sachet to ensure fluid-tightness upon being tightened, each member being configured for forming substantially half of the chamber for containing and ensuring a specific sachet shape. In one embodiment, the second member has provision for perforating an upper surface of a sachet for introducing water into the sachet. In another embodiment, the first member has an injector member which projects beyond the raised portions for perforating and introducing water into the sachet. The first and second members may be mounted on a chassis so that the members are mounted about an axis so that upon movement about the axis, the members are brought together so that they form the chamber, and a rim of the first member and an edge of the second member cooperate for gripping an edge of a sachet.

17 Claims, 7 Drawing Sheets



U.S. Patent

Oct. 27, 1998

Sheet 1 of 7

5,826,492

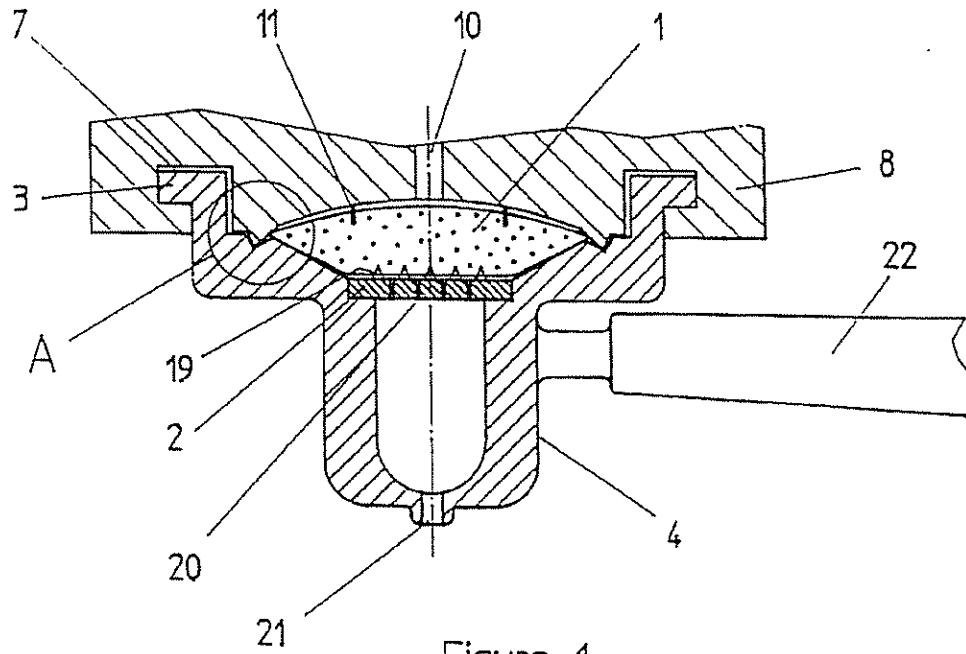


Figure 1

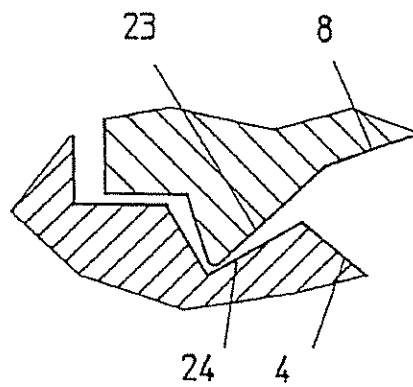


Figure 1a

U.S. Patent

Oct. 27, 1998

Sheet 2 of 7

5,826,492

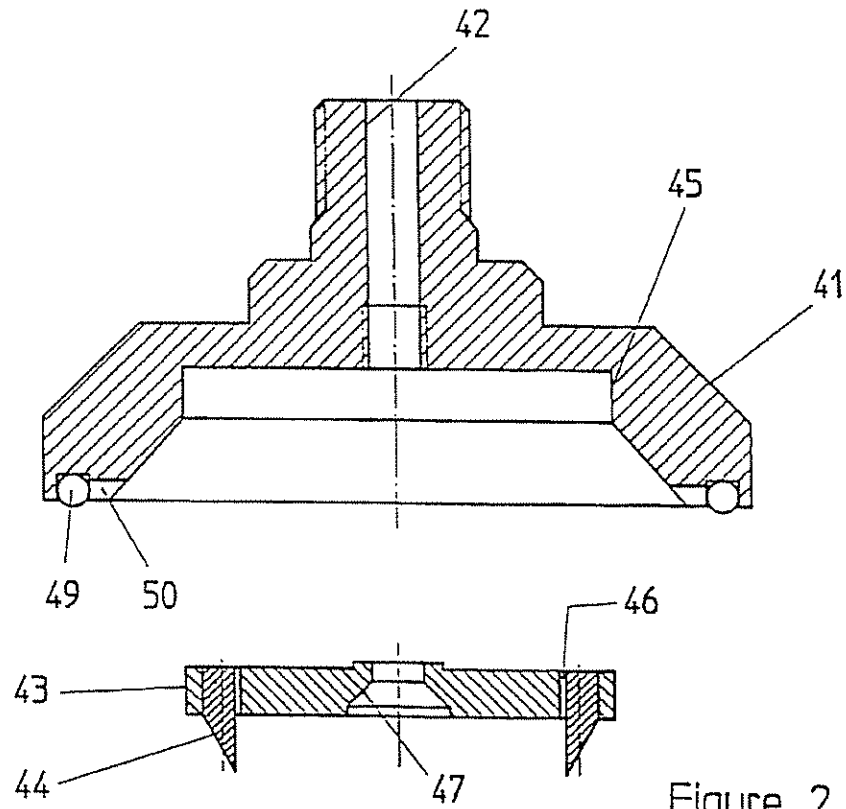


Figure 2

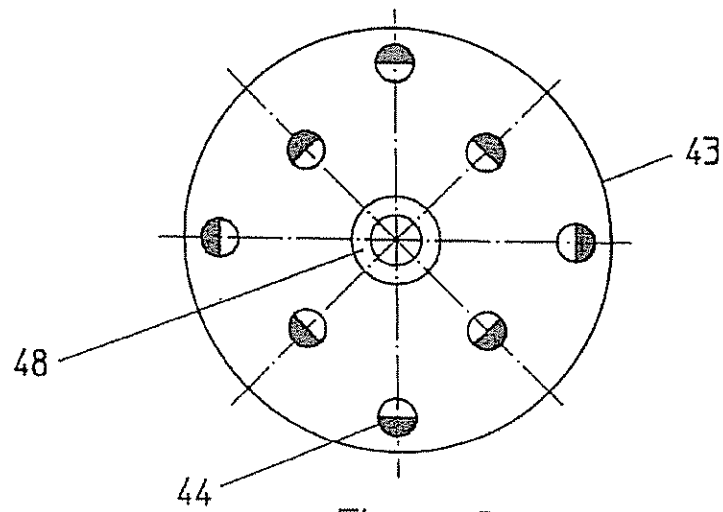


Figure 3

U.S. Patent

Oct. 27, 1998

Sheet 3 of 7

5,826,492

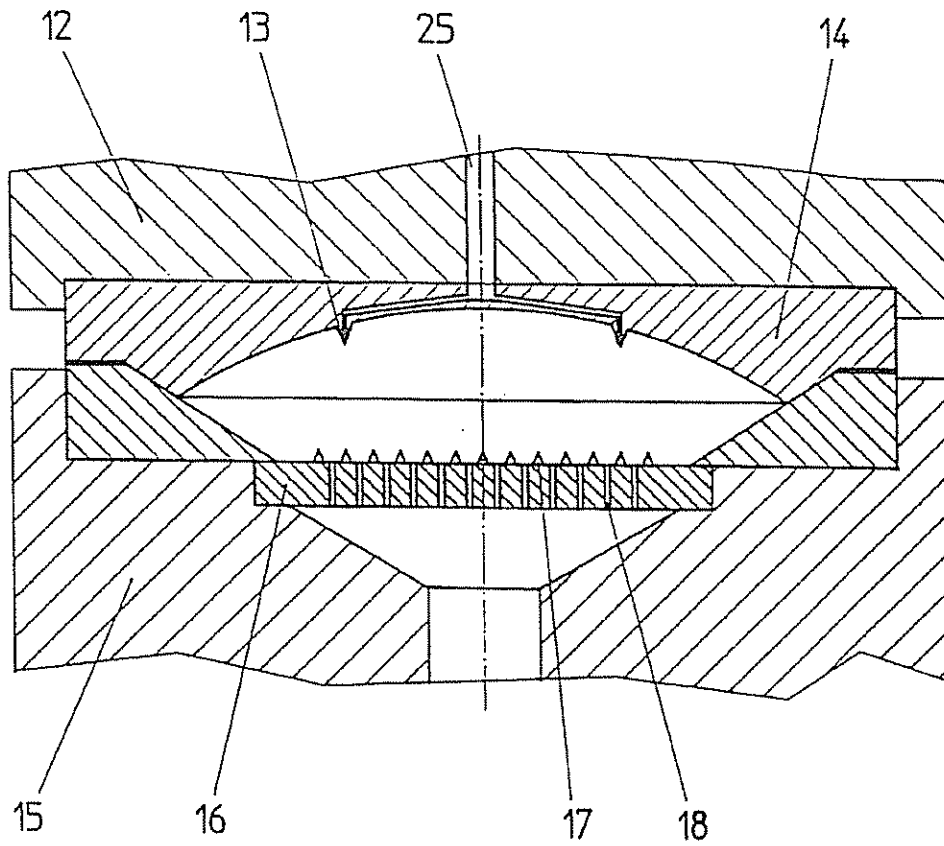


Figure 4

U.S. Patent

Oct. 27, 1998

Sheet 4 of 7

5,826,492

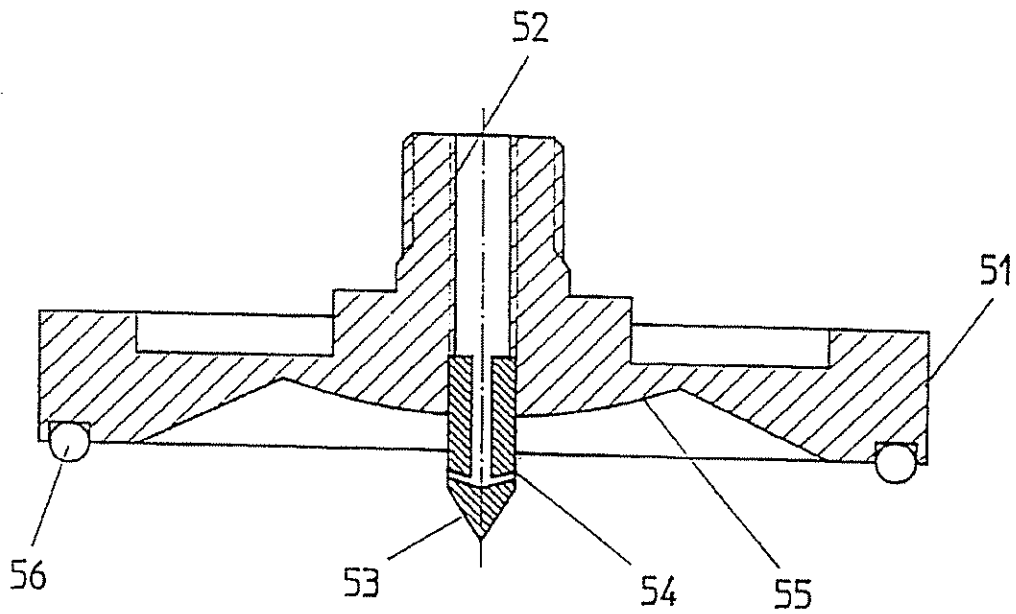


Figure 5

U.S. Patent

Oct. 27, 1998

Sheet 5 of 7

5,826,492

Figure 6

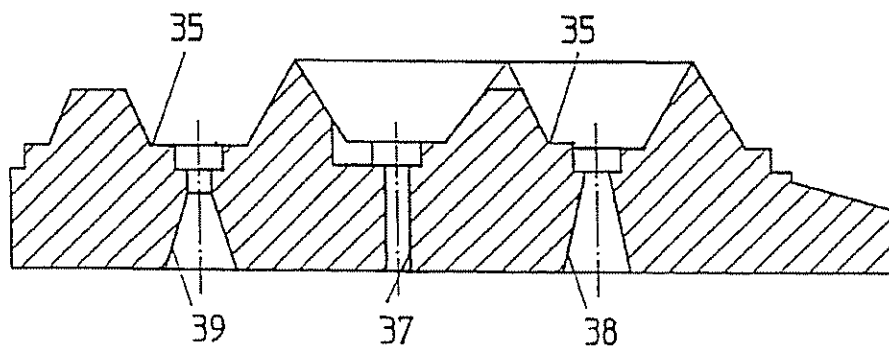
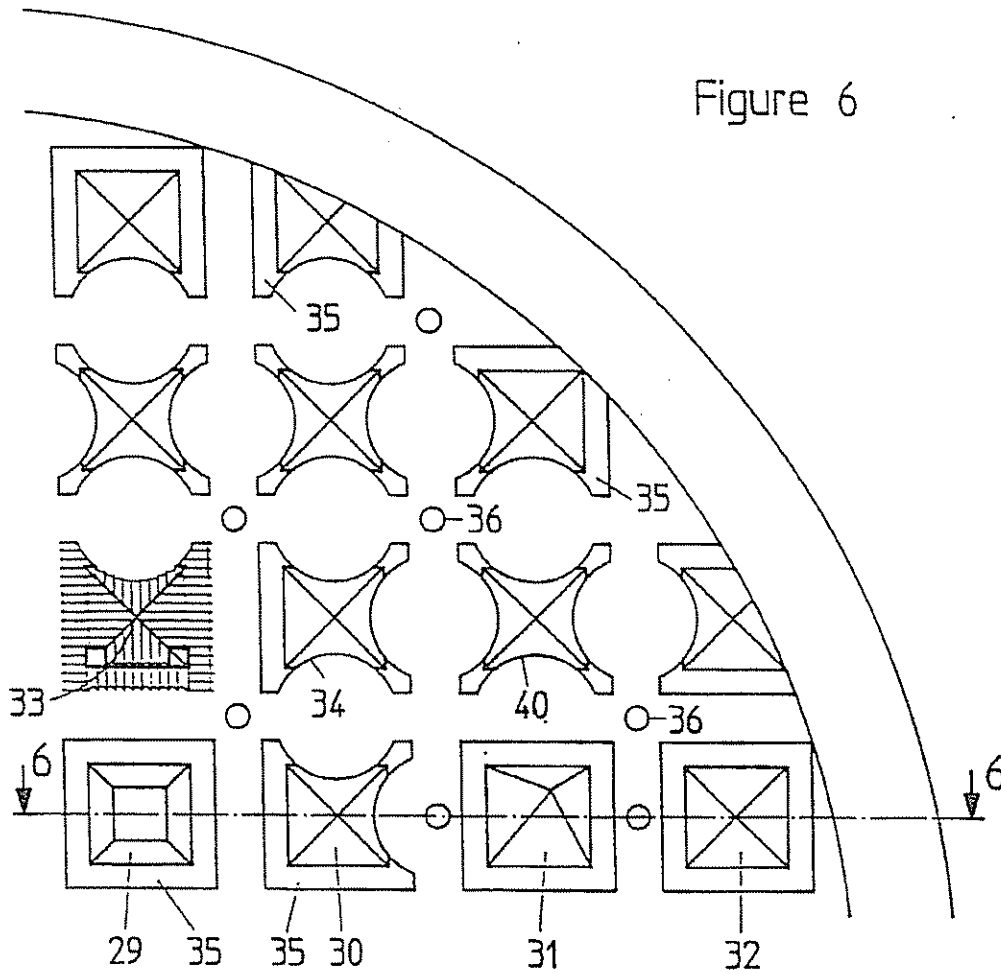


Figure 7

U.S. Patent

Oct. 27, 1998

Sheet 6 of 7

5,826,492

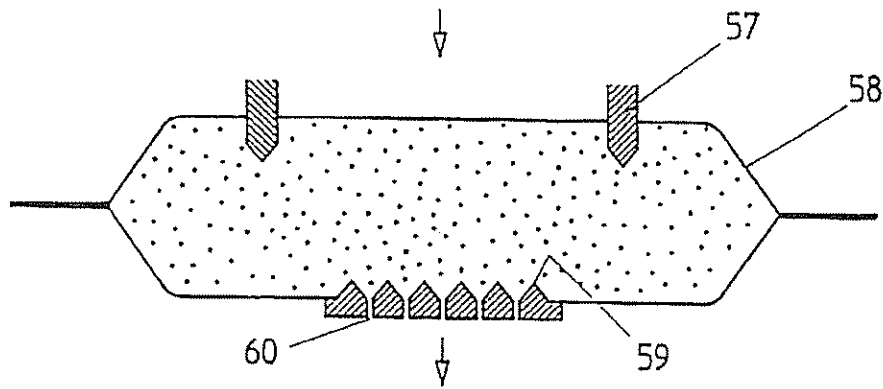


Figure 8

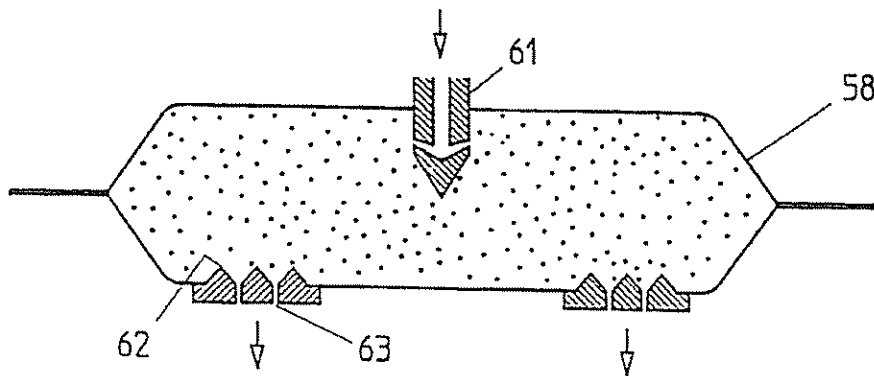


Figure 9

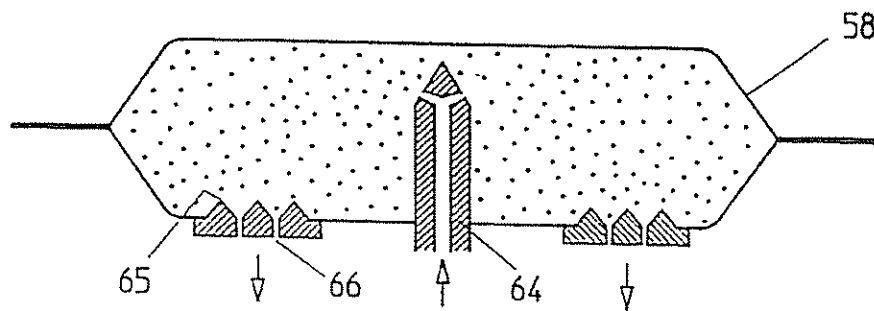


Figure 10

U.S. Patent

Oct. 27, 1998

Sheet 7 of 7

5,826,492

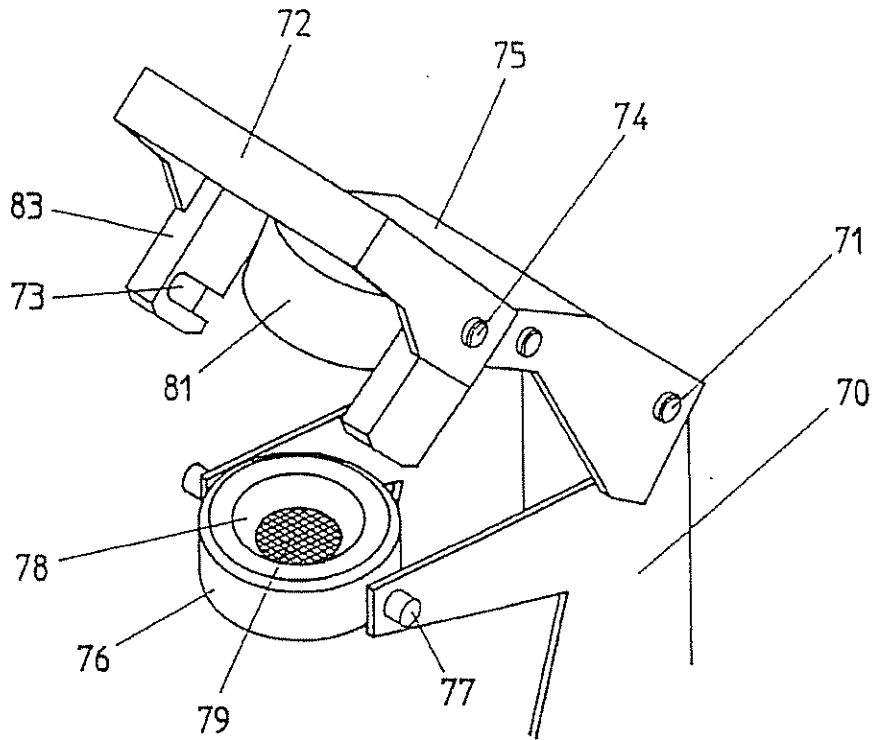


Figure 11

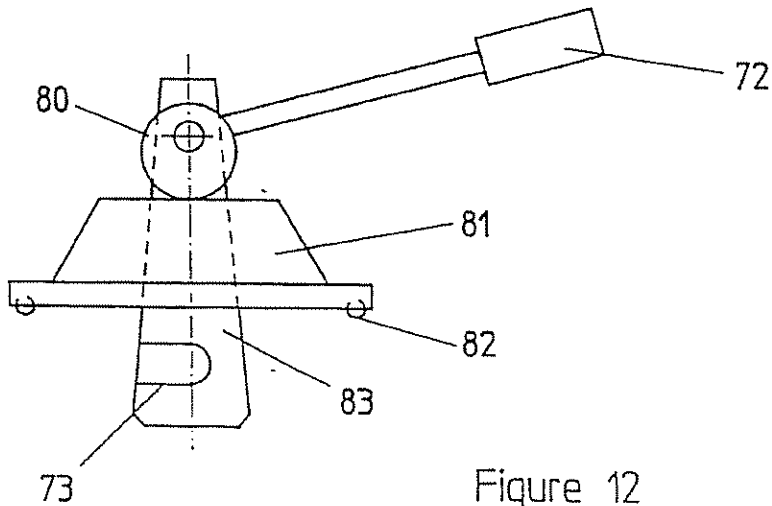


Figure 12

5,826,492

1

APPARATUS FOR EXTRACTING A SUBSTANCE CONTAINED IN A SACHET

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation application of application Ser. No. 08/178,325, filed Jan. 11, 1994, now U.S. Pat. No. 5,649,472.

BACKGROUND OF THE INVENTION

The invention relates to apparatus for extraction of sealed flexible sachets containing at least one substance for the preparation of a beverage.

The use of pre-metered and pre-packaged portions of ground coffee for the preparation of espresso-type coffee has the advantage that it facilitates the operations to prepare the coffee while ensuring that the quality of the product is relatively consistent.

These portions are currently provided in two main forms.

According to a first general form, the portions disclosed in Swiss Patent No.-636 311, U.S. Pat. No. 5,012,629 and European Patent Application Publication No.-0 272 432 are formed by two sheets of filter paper sealed over their periphery and filled with ground coffee. This solution has the drawback that an oxygen-barrier outer packaging is required to prevent the oxidation of the product during storage. This outer packaging entails additional costs and a supplementary operation for the consumer who has to remove it before the desired coffee can be extracted.

According to a second form, disclosed in Application PCT/CH91/00 222, the portion is formed by a leak-tight capsule with a concave base opening into its extraction device by deformation under the action of the introduction of the extraction fluid, then perforation against pointed members. This capsule, formed by a leak-tight envelope forming a lateral wall and two walls, one of which forms the base of the cartridge and the other of which closes the opposite end of the cartridge, has the drawback that it makes simultaneous use of several different packaging materials, at least one of which has to be thick enough to make it semi-rigid. It can be used only in one direction with an extraction device which is completely adapted to the capsule and to its arrangement. Moreover, it is relatively bulky as the coffee is not compacted.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a method and apparatus for allowing extraction of a substance for preparation of a beverage contained in a sealed flexible sachet without prior opening, the method entailing no particular requirements as regards the positioning of the upper and lower surfaces of the sachet.

Accordingly, the present invention provides an apparatus for the extraction which comprises a first, or lower, member having raised and hollow portions forming a flow zone and comprises a second, or upper member, each member forming, for extraction of the substance contained in the sachet, substantially half of a chamber for containing and ensuring a specific shape of the sachet, which is not necessarily identical to its initial shape, and the members cooperate to grip the edge of the sachet to ensure fluid-tightness. Tightening is ensured by auxiliary fastening means which make the first and second members rigid with one another. The second member may include means adapted to perforate the upper surface of the sachet and allow the introduction of

2

water into the sachet. Alternatively, the first member may include a water injector member which projects beyond that of the raised portions for introduction of water into the sachet.

The present invention also provides a method in which the sachet is positioned and held in the extraction apparatus which is formed by a closed chamber comprising a sachet holder, a mixture of air and water at a pressure of between 2 and 20 bar is introduced into the sachet by means of an inlet member in order, progressively and locally, to stretch the extraction surface of the sachet against a raised surface of the sachet holder comprising raised and hollow portions, the extraction surface being torn at multiple locations in accordance with a pattern predetermined by the location of the raised and/or hollow portions, thereby achieving its breaking tension in order to allow the flow of the liquid after extraction.

A sachet package employed in accordance with the present invention is formed from two thin flexible sheets of the same material sealed over their periphery and substantially symmetrical to one another with respect to the plane of sealing. The substance may be in the form of powder or is compacted into a cake of appropriate shape in one or a plurality of pieces.

The method and use of the apparatus are also characterized by the high value of the extraction pressure, as its maximum value is not necessarily reached during the opening of the sachet, but may be reached later during extraction when the loss of load through the bed of coffee has reached its maximum.

DETAILED DESCRIPTION OF THE INVENTION

The description below, although applied to roast and ground coffee, is not limiting and is given by way of example, as the method can be applied to other products or mixtures of products contained in a flexible sachet such as tea, soluble coffee, chocolate or dehydrated foodstuffs adapted to provide drinks or foodstuffs in the form of infusions.

The method and use of the apparatus of the present invention are described further by description of successive stages of the method, which may be carried out, in the particular case of its use for coffee, using commercially available espresso machines comprising means, whether integral or through the addition of adapters, for perforating one of the surfaces of the sachet, introducing water therein, tearing the other surface in a controlled manner as a result of its deformation under the effect of pressure and collecting the coffee extract.

During a first stage, the sachet is positioned in the sachet holder, the lower surface becoming the extraction surface in this arrangement.

During a second stage, the sachet holder provided with the sachet is placed in the machine and the upper surface of the sachet is then perforated by the cutting or perforating member(s) disposed below the lower surface of the upper portion of the extraction chamber.

During this stage, the shape of the sachet may be modified at will with respect to its initial shape by adaptation to the configuration of the chamber of the extraction apparatus. The shape of the sachet is thus fully defined prior to extraction during its positioning, even after undergoing possible deformations resulting from prior handling, in particular when the sachet contains a product which is only slightly compacted or not compacted at all.

5,826,492

3

According to a variant of the method, the positioning operation entails a clamping effect which reduces the available inner volume of the sachet in order to limit those locations not filled by the substance to be extracted to a predetermined minimum. Depending on the method of production of the sachet, its initial volume may be greater than that of the substance which it contains if it is desired that this substance should be slightly compacted prior to extraction, as is the case with ground coffee. This adaptation of the available volume makes it possible to facilitate extraction; as the substance is uniformly disposed in the chamber, it is correctly traversed by the extraction fluid and when removed, moreover, the sachet is not impregnated with excess water, which facilitates the cleanliness and practicality of the method.

Moreover, the flexible upper surface of the sachet may, under the effect of the water pressure and the swelling of the coffee, be forced against the upper surface of the chamber, thereby improving the moistening of the coffee and the quality of its extraction.

According to a further variant of the method, auxiliary means provided below the upper surface of the extraction device and/or on the lower surface of this device make it possible to move the coffee in the sachet towards specific and preferred zones in order to facilitate the quality of the extraction by avoiding dead zones.

These means may consist in a particular geometrical shape of these surfaces.

In order to regularize extraction from a bed of substance, it is desirable that this bed is not too thin or of unequal thickness. In the case of a flexible sachet, these drawbacks would occur if the means described above were not used.

According to a variant of sachets containing coffee compacted during production, the volume of the chamber corresponds very closely to the size of the cake and the sachet in order to avoid free zones between the sachet and the cake and undesirable preferential paths during extraction.

During a third stage, the water, possibly mixed with air, is introduced into the sachet at a pressure of between 2 and 20 bar, preferably between 4 and 15 bar. The surfaces of the sachet are forced against the walls of the extraction chamber and the extraction surface is locally deformed by progressive stretching, under the effect of the pressure, against the raised portions of the sachet holder which is provided with discharge apertures for the infusion. This essential stage provides a period of premoistening of the coffee prior to extraction.

The air may be the air present in the ducts of the machine which is mixed with the water during the activation of the extraction process.

In certain conditions, depending on the espresso machines used and the initial heating temperature, the initial fractions of water may be in the form of steam.

According to a variant of the method, a pause, during which no further extraction liquid is introduced, may be provided between the third and fourth stages.

During a fourth stage, the material forming the extraction surface reaches its breaking tension as a result of being stretched and starts to tear at the location of the projecting raised portions or in the hollow portions formed between these raised portions. Depending on the shape of the raised portions, the tears may also extend into both zones mentioned above. The portions split in this way, without becoming detached from the extraction surface released from its tension, are applied against the raised portions with the result that the

4

apertures formed become larger, facilitating the subsequent flow of the extraction liquid, but in such a way that there is no dispersion of material outside of the sachet. The inner pressure of the sachet drops partially, but this momentaneous decompression is limited, as the flow of fluid escaping from the sachet is laminated both by the small interstices formed by the lips of the torn material of the extraction surface applied against the raised portions and by the flow apertures provided in or in the vicinity of the raised portions. The flow is thus fully controlled, in particular preventing any undesirable movement of the solid phase of the content of the sachet which could obstruct the flow apertures and further impede the regularity and reproducibility of the extraction process.

According to the terminology used in Swiss Patent Specification No.-668 545 relating to a capsule with a pre-weakened cap, this stage of opening of the sachet can be considered as a stage of aeration of the powder material.

According to a variant of the method, a pause, during which no further extraction fluid is introduced, may be provided between the fourth and fifth stages.

During a fifth stage, the coffee is extracted at a pressure of 2 to 20 bar, this pressure being intentionally and essentially linked to the loss of load through the bed of moistened coffee which is compacted for this reason.

This is the extraction stage.

Supplementary apertures in the extraction surface may be produced when necessary by raised portions of the sachet holder of decreasing height, provided preferably in its peripheral zone, when the extraction pressure reaches high values.

During a sixth stage, the sachet holder is released and the sachet is removed, for instance simply by upturning the sachet holder.

According to a variant of the system of a flanged type, described below, the sachet is removed manually by means of an insert or automatically into a suitable container at the end of the fifth stage.

According to a first variant of the method, the tears are produced in the central portion of the (hollow) cavities formed between the projecting portions of a raised member when the material reaches its breaking tension following deformation.

According to a second variant of the conduct of the method, the extraction surface of the sachet may start to tear at the raised portions, tearing extending into the centre of the (hollow) cavities formed by these portions.

According to a third variant of the method, the opening of the extraction surface takes place by obtaining the breaking tension at the location of the raised portions possibly associated with supplementary members which are not designed to tear the extraction surface of the sachet but to facilitate the flow, while ensuring the cleanliness of the system.

The coffee extract passes between the torn and deformed portions of the extraction surface of the sachet and reaches the flow apertures, as these torn portions cannot be forced in a completely leak-tight manner against the raised portions because of a certain relative rigidity due to their fairly small dimensions.

Some tens of tears are preferably produced in the extraction surface. In general, the geometry of the raised portions is arranged such that the torn portions are not completely detached but remain rigid with the sachet.

The sachet used for the application of the method of the invention may be of a type similar to that forming the subject matter of European Patent Application 92.111.422.9 filed on

5,826,492

5

6 Jul. 1992 by the applicants under the title "Sealed flexible sachet and its method of manufacture".

The inner diameter of the sachet is preferably between 25 and 70 mm and the sealed edge has a width of 3 to 15 mm. Once filled, the sachet preferably has a thickness of between 5 and 20 mm at its centre. In the case of coffee, the quantity which it contains may vary between 5 and 20 g of ground coffee possibly compacted into the form of a cake. The general shape of the sachet is circular, oval or polygonal with four to ten sides possibly with rounded edges, or may be a combination of these three elements.

After positioning in the machine, the extraction surface of the sachet is not necessarily disposed in a horizontal plane. Other orientations may be preferred for the ease of processes of use.

According to a particular arrangement of the extraction chamber of the device of the present invention, its inner volume is smaller than the initial volume of the sachet. This arrangement applies in particular to the extraction of non-compacted sachets.

According to a further particular arrangement of the extraction chamber, the upper member and/or the lower member have elements helping to move the substance to be extracted into specific and preferred zones in the interior of the sachet.

These elements may take the form of projections disposed on the lower surface of the upper member and/or of a particular geometry of the upper surface of the lower member of the extraction device, preferably circular, helical or in the form of portions of straight lines or arcs. This arrangement applies in particular to the extraction of non-compacted sachets.

According to a first variant of the device for introducing water, the means of the upper member adapted to perforate the upper surface of the sachet and introduce water therein may take the form of a water distribution grid provided on its lower surface with members such as projecting points, blades or crosses, for instance those disclosed in European Patent Application 91.111.211.8 filed on 5 Jul. 1991. The water throughput apertures do not necessarily coincide with these members but may advantageously be located on their periphery.

According to a second variant, one or a plurality of water injection needles may be provided and disposed to project into the chamber of the upper member, for instance of the type disclosed in European Patent Application 90.114.402.2 filed on 27 Jul. 1990. A needle of this type makes it possible to perforate the upper surface of the sachet when positioned in the complete device and to inject the fluid within the sachet.

The water injection needle(s) are designed with a tapered shape so that they perforate the material of the sachet with openings which are able to close again at least partially in order to minimize discharges when the sachet is removed. Moreover, they do not prevent the sachet from swelling and being forced against the neighbouring wall. The dimensions and arrangement of these water injection means are selected so as not to create undesirable preferential paths through the bed of coffee, but to wet it uniformly throughout its volume. The shape, dimension and arrangement of the needle(s) are adapted to the shape and dimensions of the sachet.

In the case of an arrangement comprising a plurality of water injection needles, it may be advantageous to mount these needles on a member able to move in rotation so as not to tear the sachet, this movement then being synchronized by entrainment during the insertion of the sachet holder.

According to a preferred variant of the upper member and its integral portion participating in tightening, these mem-

6

bers may be an integral part of espresso machines specially designed for the extraction of such sachets.

According to a conventional arrangement of this variant, the tightening means integral with the upper member takes the known form of tightening flanges, preferably two to three, which are conventionally found in espresso machines with fastening devices of the bayonet type.

According to a particular embodiment, the lower detachable member causes the simultaneous rotation of the lower portion of the upper member comprising the water introduction means, thus preventing any risk of accidental tearing of the sachet when the water introduction means comprise a plurality of openings.

According to a variant of the upper member and its integral portion participating in tightening, these members may form part of a more overall detachable member which can be fitted to conventional commercially available espresso machines thus allowing the extraction of such sachets.

According to a first arrangement of this variant, the adaptation enabling the extraction of sachets is carried out using two components one of which may remain temporarily in place in the espresso machine. The first component, called an adapter, is fitted on the espresso machine for which it is produced, and the second component, called a sachet holder, is mounted on the first.

The first of these components, the adapter, comprises on its exterior, tightening lugs adapted to engage on the primary tightening flanges of the espresso machine. It also comprises, on its interior, secondary tightening flanges, a cavity and means adapted to perforate the upper surface of the sachet and introduce water. This first component may remain temporarily in place in the machine and be locked against rotation by means of a tightening screw.

The second component, the sachet holder, comprises clamping lugs adapted to engage on the secondary tightening flanges of the preceding component as well as a cavity and raised and hollow portions on a component comprising flow holes (lower member).

These two components are of the type of the invention disclosed in European Patent Application 91.111.212.6 filed on 5 Jul. 1991, but adapted specially for the extraction of flexible sachets, in particular as regards the shape of the cavity adapted to receive the sachet, the water introduction means and the flow member.

According to a second arrangement of this variant, the adaptation enabling the extraction of sachets is carried out using two components which have to be associated before the assembly can be placed in the espresso machine.

The upper component, placed or articulated on the lower component, comprises members adapted to the water distribution member of the espresso machine and designed to cooperate with the fluid-tight joint of this machine, a cavity and means adapted to perforate the upper surface of the sachet and inject water.

The lower component comprises tightening lugs adapted to engage on the tightening flanges of the espresso machine and raised and/or hollow members integral with a component acting as a flow grid. This component corresponds to the sachet holder. Operated by means of a handle, the assembly formed by the lower and upper components performs a rising or descending rotary movement once it is engaged in the tightening flanges of the espresso machine.

These two components are of the type of the invention disclosed in European Patent Application 91.111.211.8 filed on 5 Jul. 1991, but specially adapted for the extraction of flexible sachets, in particular as regards the provision of the chamber designed to receive the sachet.

5,826,492

7

According to a particular embodiment of the lower member of the extraction device and its fastening means, these members may be in the form of a sachet holder of the type of the cartridge holder disclosed in European Patent Application 92.107.548.7 filed on 5 May 1992 but adapted for the extraction of flexible sachets. The sachet holder may then incorporate the specific members disclosed in this prior application and in particular, as regards its fluid-tight device, the possible separation of the sachet holder and the sachet holder support with the possibility of rotation with respect to one another, the possibility of integrating one or two cones internally in order possibly to separate the flow of the extract and the reflux of substance once it has been extracted.

The lower portion of the chamber and the component comprising the raised portions are not necessarily integral.

The sachet holder may be in one piece, comprising the lower component and its support, including the tightening means, or in two pieces comprising the lower component (including the raised and hollow portions on a component enabling the flow) and the support for this component including the tightening means.

With particular reference to the fluid-tight device, according to a first arrangement, the lower outer surface of the upper member comprises a conical edge. A corresponding conical portion faces this edge on the periphery of the sachet holder. The two portions engage with one another gripping the edge of the sachet. The angles are preferably slightly different for each of the two cones, limiting the zone of theoretical contact to a narrow crown.

According to a second arrangement of the fluid-tight device, the lower portion of the upper member presses the rim of the sachet against an elastic O-ring disposed on the periphery of the sachet holder.

According to a preferred variant of the device, the member with raised and hollow portions and a fluid-tight cone comprises a rim whose lower portion is shaped as a convex spherical ring whose centre of curvature coincides with the axis perpendicular to the plane of the bearing surface of the sachet, this spherical rim bearing freely on a seat having a concave surface of the same curvature rigid with the lower member (sachet holder support) and preferably formed from a material with a low sliding coefficient. Consequently, the assembly forms a swivel joint assembly. It will be appreciated that the direction of the curvatures can be reversed.

According to a preferred variant, fluid-tightness takes place by means of a flexible joint, characterized in that it is disposed freely in a housing allowing it, under the pressure of the water disposed between the joint and the base of the housing, to push this joint and cause it to be crushed against the edge of the sachet. In this variant, the pressurized water pushing the joint vertically is supplied via the base of the housing.

According to a second configuration of this variant, the housing receiving the flexible joint has only a radial play. In this case, the water which deforms the joint is directly that contained in the extraction chamber.

In the two above configurations, the joint may be toric, cylindrical or any other known and commercially available shape.

According to a particular arrangement of the fluid-tight device, the upper and lower members comprise complementary members adapted to fit one another, making it possible to stretch the surfaces of the sachet during the tightening of the assembly (lower member against the upper member with the sachet disposed therebetween).

In the case where the sachet has, in the peripheral zone of both its surfaces, corrugations created during manufacture in

8

order to compensate, without the appearance of random folds, the filling of the two plane sheets, the surfaces bounding the cavities of the upper and lower member of the extraction device and their edge ensuring sealing during extraction, may be raised in the form of corrugations compatible with those of the sachet.

A similar arrangement of the contact zone between the upper member and the lower member may be advantageously provided even when extracting flexible sachets whose periphery is plane. In this arrangement, the corrugations are, however, of small amplitude and are just sufficient to stretch the edge of the sachet in order to suppress any accidental folds.

The raised portions ensuring the opening of the extraction surface of the sachet are of the same type as the five types disclosed in European Patent Application 92.107.548.7 filed on 5 May 1992.

According to a first embodiment, the raised portions are formed by small rods which are rectilinear or slightly sinuous or in the form of closed or unclosed arcs having separate lengths and disposed in a radial, concentric, parallel or perpendicular manner on a grid perforated with a large number of small holes. They may have a semi-circular or approximately trapezoidal cross-section. Their width and height are from 0.5 to 7 mm.

According to a second embodiment, the raised portions may also take the form of small prisms, truncated pyramids, cylinders or truncated cones of circular or non-circular polygonal section.

According to a third embodiment, the bases of the raised portions have circular or ovoid cavities at the base of which the flow holes for the coffee are disposed. The depth of the cavities may range from 1 to 7 mm.

According to a variant of the three above-mentioned embodiments, the raised portions form a part disposed on a flow grid.

According to a further variant, the raised portions may be an integral part of a plate drilled with filtration holes for the flow of the extract.

According to a fourth embodiment (not shown), the relative arrangement of the raised portions and the flow holes is reversed. The raised portion is formed by a component comprising portions which are hollow with respect to the main surface and flow holes provided at least in the projecting portion. The material tears so as to expose the projecting portions provided with the holes.

According to a fifth embodiment, the raised portions are pyramidal members associated with complementary members which are not designed to tear the extraction surface of the cartridge but to facilitate the flow of the fluid extract while retaining the substance, for instance in the form of terraces with a width of 0.2 to 1 mm surrounding the pyramidal shapes and channels at the base with a width of approximately 0.7 to 2.5 mm and a depth of approximately 0.3 to 1.8 mm. These channels are drilled with a number of flow holes calibrated to a diameter of some tenths of a millimeter.

According to a first variant, the pyramidal shapes are formed by truncated pyramids with sides measuring 1 to 7 mm and a height of 1 to 7 mm, preferably disposed in a grid whose pitch is conventionally between 3 and 10 mm. The surfaces preferably have an angle of 10° to 30° to vertical.

The upper surface of the pyramids acts as a support surface when the sachet is subjected to the effect of pressure. The tearing commences at the peaks of these pyramids.

According to a second variant, the pyramidal shapes are formed by full and/or partial, i.e., asymmetrical, pyramids.

5,826,492

9

These asymmetrical pyramids may be obtained either with pyramids whose vertical surfaces do not all have the same angle or with pyramids which were originally symmetrical, from which vertical portions have been removed.

In this fifth embodiment, the surfaces of the raised portions and possibly the terraces and channels may have small furrows (channels) facilitating the evacuation of the extract, the material of the extraction surface of the sachet being rigid enough to prevent it from completely matching the shape of the furrow.

Several types of pyramid may co-exist in this fifth embodiment.

According to a sixth preferred embodiment, the height of the pyramids and the adjacent channels is not constant over the entire surface. A part thereof is adapted to cause the opening of the sachet only when a pressure higher than the conventional value is reached, thus correcting the extraction flow by increasing it. This effect is preferably obtained by decreasing the height of the pyramids and increasing the depth of the channels separating the terraces. Its objective is to regularize the flow from different sachets which could otherwise vary depending on the blend of coffee which they contain.

According to a variant of the above-mentioned shapes, the extraction may be limited to a preferably annular zone of the lower surface, in order to force the water to travel a maximum path through the bed of coffee when the water is introduced centrally. Reciprocally, the reverse configuration is possible.

In all the cases described above, the openings of the lower wall of the sachet are the result of deformation to breaking point, but only under the effect of and after pressurization by water or the extraction mixture of water and air.

Instead of disposing the sachet in the sachet holder which is then disposed in the machine, a device may be provided in which the sachet holder is an integral part of the machine in a system known as a jaw system, the sachet being inserted directly in the machine and the perforation of the upper portion of the sachet being carried out by the cutting or perforating members when the jaw is closed.

In this case, the upper member or the lower member may have either a movement of rotation about a horizontal or vertical axis, or a folding movement, or a drawer movement allowing this insertion. The two members are made integral during extraction by a system of hooks or any other appropriate device. The advantage of this solution is that at the moment of tightening or release, there is no rotary movement of the sachet thereby avoiding the use of rotary showers or pyramids.

A further advantage is that the tightening force prior to extraction may be higher by means of a gear reduction device. Moreover, with this system, it is possible to envisage an automatic ejection of the sachet after extraction into a tank provided for this purpose.

This arrangement also makes it possible to introduce water and extract coffee on the same side of the sachet, the water introduction member(s) and the raised portions preferably being concentric, the former in the centre and the latter on the periphery.

In a simplified version, the sachet is removed by means of a collar which may or may not be an integral part of the sachet holder. This collar may for instance have an annular shape and be inserted around the member comprising the raised portions. It can be moved by a spring for the ejection of the sachet or be withdrawn manually from the lower portion. In the absence of this collar, the use of a sachet provided with a lateral tongue is particularly advantageous.

10

It is evident to a person skilled in the art that the various variants mentioned above can be adapted to be integrated in an automatic mechanical device which, using known auxiliary means which are not therefore described in detail, carries out the positioning of the sachet, fluid-tightening and after infusion, the release and removal of the used sachet. The arrangement of the respective members may be modified with respect to that described above, the extraction surface being disposed, for instance, in a vertical or oblique plane. In this case, the water injection may or may not be perpendicular thereto.

It will be appreciated that the whole of the above description of the device of the invention relating to the raised portions, the flow member and the fluid-tight device of the sachet holder is also valid for the sachet holder without there being any need to repeat the description relating thereto.

In particular, the sachet holder may be in one or two pieces with raised and hollow portions with asymmetrical pyramids and corrugations on the periphery of the lower member.

The following description is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE INVENTION

FIG. 1 is a diagrammatic representation of an extraction device of a closed flexible sachet.

FIG. 1a is an enlarged view of part A of FIG. 1.

FIG. 2 is an exploded sectional view of the upper member for the injection of water of this device.

FIG. 3 is a plan view of the various water injection points of FIG. 2.

FIG. 4 is a partial diagrammatic view of an extraction device of a closed flexible sachet according to a second embodiment.

FIG. 5 is a diagrammatic view of the upper member for water injection according to a second embodiment.

FIG. 6 is partial plan view of the lower member formed by raised and hollow portions and flow holes.

FIG. 7 is a section along the line 6—6 of FIG. 6.

FIG. 8 is a diagrammatic view of the positioning of the water inlet members provided below the upper surface of the device and the raised members provided on the lower surface for the flow of the coffee extract.

FIG. 9 is a diagrammatic view of the positioning of the water inlet members provided below the upper surface of the device and the raised members provided on the lower surface for the flow of the coffee extract, according to a second embodiment.

FIG. 10 is a diagrammatic view of the positioning of the water inlet and coffee extraction members, both provided on the lower surface of the device, according to a third embodiment.

FIG. 11 is a diagrammatic perspective view of an extraction system of a closed flexible sachet, according to a third embodiment.

FIG. 12 is a diagrammatic view of the upper member of the extraction system of FIG. 11.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1, the sachet 1 is disposed on the lower, or first, member having base 2 and support 4, the support 4 has a wall surface which extends laterally from the base 2 to a rim 24 (FIG. 1a) to define a first member cavity, and the sachet

5,826,492

11

holder. The support comprises two diametrically opposite tightening lugs 3 adapted to engage on the tightening flanges 7 of the upper member 8.

The upper, or second, member 8 has a wall surface which extends to an edge 23 to define a second member cavity and comprises a water inlet 10 and pointed members 11 in order to perforate the upper surface of the sachet 1. The lower member base 2 has projecting portions 19 and flow holes 20.

In operation the sachet 1 is disposed on the lower member base 2 and by maintaining the support assembly 4, the lower member 2 and the sachet 1 by the handle 22, the tightening lugs 3 are engaged on the tightening flanges 7 of the upper member 8.

Fluid-tightness is ensured at in section "A" of FIG. 1, as further illustrated in FIG. 1a. The lower inner conical edge 23 of the upper member cooperates mates with the conical rim 24 of the lower member, thereby gripping the periphery of the sachet 1. The pointed members 11 pierce the sachet 1 and the hot water is supplied via the water inlet duct 10 and penetrates into the sachet 1. The pressure in the sachet increases and the lower surface of the sachet is forced against the projecting portions 19 until it tears on these projecting portions when it reaches its breaking tension. The extraction stage then commences. The coffee flows via the flow holes 20 and is collected under the bore 21 in a container (not shown).

FIGS. 2 and 3 show an upper member for the supply of water which differs from that of FIG. 1. This member is in two pieces. The portion 41 comprises a central water inlet 42, and a disc 43 bearing pointed members 44 is adapted to pierce the upper surface of the sachet to be extracted, this disc being adapted to be housed in the housing 45 of the portion 41. The bore 46 of the disc 43 is partially occupied by the pointed members 44, making it possible to allow the passage of water so that it penetrates into the sachet to be extracted. The disc 43 may rotate in its housing 45 and is held in place by a screw 48 (FIG. 3) disposed in the bore 47 of the disc 43.

An O-ring joint 49 is provided as well as a plurality of water inlet ducts 50 disposed on the periphery of the portion 41 so that during extraction the water pushes the joint downwards thus ensuring that the system is fluid-tight.

In FIG. 4, the extraction device comprises an upper member 12 having injection needles 13 disposed under the vault of the cavity. During clamping, the injection needles perforate the upper surface of the sachet enabling the subsequent introduction of extraction fluid supplied via the duct 25. This upper member has a projecting portion 14 of conical appearance. This projecting portion fits into a complementary cone 26 disposed in the lower support 15. As they fit into one another during the clamping of the members, these portions help to stretch the surfaces of the sachet and centre the powder substance.

The lower member 16 also has projecting portions 17 and flow holes 18 through which the coffee can flow.

FIG. 4 does not show the fastening system using the tightening lugs and flanges. The method of extraction is the same as for the device of FIG. 1.

FIG. 5 shows a further embodiment of the upper water injection member 51 comprising a water inlet 52 and a single pointed member 53 adapted to perforate the sachet, this pointed member comprising a bore 54 supplying water to the sachet. This member 51 comprises a concave zone 55 allowing an improved distribution of the water so that the upper surface of the sachet is forced against the concave zone. It also has an O-ring joint 56 to ensure fluid-tightness.

12

FIG. 6 shows various types of raised pyramidal portions. These include truncated pyramids 29, pyramids 30 cut away on two sides, asymmetrical pyramids 31, symmetrical pyramids 32, pyramids 33 with corrugations, pyramids 34 cut away on three sides and pyramids 40 cut away on four sides. These pyramids all have terraces 35.

The flow holes 36 may be of three different shapes: cylindrical 37, flared downwards 38 or cylindrical and flared downwards 39.

The presence of terraces 35 makes it possible to control the opening (or tearing) of the lower surface of the sachet, making it possible to provide the sachet with a filter function.

FIG. 8 shows the members 57 for piercing the sachet 58 and the raised and hollow portions 59 disposed about the flow holes 60. This system is equivalent to that of FIGS. 1 and 4.

FIG. 9 shows the extraction of a sachet 58 with a single pointed member 61 and raised and hollow portions 62 and flow holes 63 disposed on the periphery of the sachet.

Finally, FIG. 10 shows a single pointed member 64 for the upward supply of water and the coffee collection system on the same side comprising raised and hollow portions 65 about the flow holes 66.

FIGS. 11 and 12 show an extraction system comprising a chassis 70 on which there is mounted to rotate along the rod 71 an arm 75 itself comprising a locking lever 72 with hooks 73 mounted on an arm 83, this lever being mounted to rotate along the rod 74. The arm 75 is closed on a lower portion 76 mounted to rotate along the rod 77 and comprising a housing 78 with raised and hollow portions 79 adapted to receive the sachet to be extracted.

In operation the sachet is placed in the housing 78, the arm 75 is lowered by pressing on the locking lever 72 until the hooks 73 are engaged on the rod 77.

A cam 80 makes it possible to clamp the upper water supply member 81 against the lower member 76 in order to ensure good fluid-tightness of the system by correct application on the joint 82. The sachet is extracted and the locking lever 72 is released in order to raise the arm 75. A means making it possible to pivot the lower member 76 so as to eject the sachet to a compartment provided in the chassis 70 is advantageously provided.

We claim:

1. An apparatus for extracting, with water under pressure, a comestible substance contained in a sachet package comprising:

a first member and a second member wherein

the first member comprises a base, a wall surface and a wall rim wherein the wall surface extends laterally from the base to the rim to define a first member cavity and wherein the base contains holes therethrough for flow of an extract from the cavity through the base and comprises a surface and raised portions wherein the raised portions extend from the base surface into the first member cavity for tearing a sachet sheet positioned adjacent and deformed under pressure against the raised portions;

the second member comprises a wall surface and an edge wherein the wall surface defines a second member cavity and extends to the edge; and

the first member and second member are configured so that upon bringing the first member rim and the second member edge together, the first and second member cavities form a chamber confined by the wall surfaces and base and each of the cavities define

5,826,492

13

substantially one-half of the chamber for containing sheets of a sachet which extend to a sachet edge and contain a comestible substance for preparation of a beverage and so that the first member rim and the second member edge are configured to grip the sachet edge and to provide fluid-tightness and so that upon bringing the rim and edge together to grip the sachet edge and to provide fluid-tightness, the rim and edge stretch the sachet;

a chassis and chassis mounting affixed with the first member and second member so that the first and second members are mounted to the chassis about an axis so that movement of one member relative to the other is through a plane transverse to the axis and so that upon movement about the axis one member to the other, the first member rim and the second member edge are brought together to form the chamber, grip the sachet edge, provide fluid-tightness and stretch the sachet;

means which extend from the second member into the second member cavity for, upon the bringing of the first member rim and second member edge together, perforating a sheet of a sachet which contains a comestible substance for preparation of a beverage to obtain a perforated sachet and for introducing water for extracting the substance contained in the perforated sachet; and

fastening means integral with each of the first and second members and comprising a lever which extends from one of the first and second members to the other member for, upon the first and second members being together, rigidly fastening the first and second members together to form the chamber, grip the sachet edge, provide fluid-tightness and stretch the sachet.

2. An apparatus according to claim 1 wherein one of the first member rim and the second member edge has a conical concave form and the other has a conical convex form suitable for mating.

3. An apparatus according to claim 2 wherein an angle of conicity of the convex form is different from an angle of conicity of the concave form to limit contact of the conical forms.

4. An apparatus according to claim 1 wherein the second member comprises two pieces wherein a first piece forms a centrally disposed portion of the second member wall surface and wherein the first piece contains a plurality of bores which extend therethrough and open into the second member cavity and wherein the means for perforating a sheet are a plurality of members which extend from the first piece to pointed ends positioned in the second member cavity so that each pointed end member occupies a portion of each bore and so that another portion of each bore is open to passage of water.

5. An apparatus according to claim 1 or 4 wherein the second member edge has an outer wall portion and a portion recessed from the outer wall portion and further comprising a flexible joint member positioned adjacent the outer wall portion and the recessed portion.

6. An apparatus according to claim 5 wherein the joint member has a shape selected from the group consisting of a toric shape and a cylindrical shape.

7. An apparatus according to claim 1 wherein the second member edge has two portions which form a recess having an obtuse angle.

14

8. An apparatus according to claim 1 wherein the first member rim and the second member edge each have a corrugated form.

9. An apparatus according to claim 1 wherein the second member wall surface has a centrally disposed convex portion and an adjacent portion which is concave.

10. An apparatus according to claim 9 wherein the means for perforating a sheet of a sachet for introducing water is an injector member which extends through the centrally disposed convex portion into the second member cavity.

11. An apparatus according to claim 1 wherein a plurality of flow holes are positioned adjacent each raised portion of the base.

12. An apparatus according to claim 1 wherein the raised portions have a shape selected from the group consisting of cylinders, truncated cones, prisms, pyramids, truncated pyramids and asymmetric pyramids.

13. An apparatus according to claim 1 wherein the raised portions have a shape of terraced pyramids.

14. An apparatus according to claim 13 wherein the terraced pyramids extend from a pyramid base to a terrace for a distance of approximately from 0.3 mm to 1.8 mm, the terrace has a width of from 0.2 mm to 1 mm and the pyramid bases are spaced to provide channels having a width of approximately from 0.7 mm to 2.5 mm.

15. An apparatus according to claim 1 wherein the raised portions have a shape of truncated pyramids which have a height of from 1 mm to 7 mm and sides having a width of from 1 mm to 7 mm to provide surfaces having an angle with respect to a pyramid base of from 10° to 30°.

16. An apparatus according to claim 1 wherein the raised portions have a shape of an asymmetric pyramid.

17. An apparatus for extracting, with water under pressure, a comestible substance and comprising:

a first member comprising a base, a wall surface and a wall rim wherein the wall surface extends laterally from the base to the rim to define a first member cavity and comprising a water injector delivery member which extends laterally from the base and into the cavity and terminates in an end suitable for piercing a sheet of material of a package containing a substance for preparation of a beverage and for delivering water under pressure within the package and wherein the base contains holes therethrough for flow of an extract from the cavity through the base and comprises a surface and raised portions wherein the raised portions extend from the base surface into the cavity to a position at a distance from the base surface which is less than a distance of the injector member end from the base surface for, upon introducing water via the injector member under pressure into an injector member pierced package and placing the sheet under pressure so that the sheet deforms, contacting the sheet so that the sheet under pressure deforms against the raised portions for tearing the sheet;

a second member having a wall surface which defines a second member cavity and which extends to an edge suitable for cooperating with the first member rim to grip a package edge and provide fluid-tightness; and means for rigidly fastening the first and second members together to grip the package edge and provide fluid-tightness.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

Page 1 of 2

PATENT NO. : 5, 826, 492
DATED : October 27, 1998
INVENTOR(S) : Olivier FOND, *et al.*

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 1, line 8, delete "472." and insert therefor -- 472, which is a National Stage Application of PCT International Patent Application PCT/CH93/00180 deposited July 12, 1993. --.

Column 10, in each of lines 24 and 63, delete "INVENTION" and insert therefor -- DRAWINGS --.

Column 10, line 65, delete "the" and insert therefor -- forming the sachet holder.
The --.

Column 10, line 67, to column 11, line 1, delete "sachet holder. The".

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

Page 2 of 2

PATENT NO. : 5,826,492
DATED : October 27, 1998
INVENTOR(S) : Olivier FOND, et. al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 11, line 16, after "cooperates", insert --and--.

Signed and Sealed this
Fourth Day of April, 2000

Attest:



Q. TODD DICKINSON

Attesting Officer

Director of Patents and Trademarks

